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THE

NATURE AND TREATMENT OF

GOUT

AND

RHEUMATIC GOUT.

BY

ALFRED BARING GARROD, M.D., F.R.S.,

Fellow of the Royal College of Physicians;
Physician to King's College Hospital; Professor of Materia Medica and Therapeutics at King's College, London.

"Observez la nature, et suivez
la route qu'elle vous trace."
J. J. ROUSSEAU.

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THOMAS WATSON, M.D., F.R.S.,

PRESIDENT OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON;
PHYSICIAN EXTRAORDINARY TO THE QUEEN.

—•—

DEAR DR. WATSON,

IT is with pleasure I again avail myself of the opportunity of expressing my appreciation of the great benefits you have conferred on the medical profession by your valuable example, and your admirable and instructive writings,—furthermore, of much personal kindness received at your hands. I confess that I should have been better pleased had I produced a work more worthy of such a dedication; but, although most imperfect, I trust you will receive it as the result of a patient investigation into the nature of a disease, which, from the many eminent characters who have been its martyrs, must naturally be of considerable interest to mankind.

I am, Dear Dr. Watson,

Yours very sincerely,

A. B. GARROD.

December, 1862.

PREFACE.

THE favourable reception of the present work by the profession, and the early demand for a Second Edition, have stimulated the Author to increased efforts to make the Book more useful, by giving the results of his wider experience of the nature and management of the diseases upon which it treats. Although the volume is little increased in bulk, considerable additions have been made to it, chiefly of a practical character, the omissions being confined either to historical matter, or to appended subjects not of essential importance.

During the time which has elapsed since the pub-

lication of the First Edition, the Author has had ample means of testing the views which he then put forward, and such opportunities have only tended to confirm his opinion as to their accuracy.

84, Harley Street, Cavendish Square,
December, 1862.

PREFACE TO THE FIRST EDITION.

As the English press already teems with works on Gout, it may be expected that an author about to add to their number, should give some explanation of his reasons for so doing.

Having carried on a series of investigations on Gout and Rheumatism for the last twelve years, some of the results of which have been already made known in the Medico-Chirurgical Transactions, I have been induced to frame the present volume, with the view of embodying my experience in a more extended and connected form.

The large field open to me as physician to a London hospital, has afforded opportunities of investigating many of the important phenomena of gout more minutely than could have been effected had the inquiries been confined to cases in private practice; and I am sanguine enough to hope that the investi-

gations will prove useful in throwing some light on its pathology, and lead to a more rational and successful mode of treatment.

The portions of the work in which the results of my own labours are more particularly contained, are the chapters devoted to the condition of the blood and the characters of the urine; also those occupied with the morbid anatomy and intimate nature of the disease. The influence of lead as a predisposing cause will be found dwelt upon at some length, as likewise the treatment of the chronic forms of the disorder.

In conclusion, I would wish to express my thanks to the Council of University College for the opportunities afforded me of making use of preparations in their Anatomical Museum for some of the illustrations contained in the Work.

84, Harley Street, Cavendish Square,
November, 1859.

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Linear power, 220.

ON GOUT:

ITS

NATURE AND TREATMENT.

CHAPTER I.

INTRODUCTORY REMARKS:—KNOWLEDGE OF THE ANCIENT WRITERS UPON THE SUBJECT OF GOUT—VIEWS OF HIPPOCRATES—CELSUS—GALEN—ARETÆUS—CÆLIUS AURELIANUS—ALEXANDER TRALLIANUS—AËTIUS—PAULUS ÆGINETA—DEMETRIUS PEPAGOMENOS—THE ARABIAN PHYSICIANS—THE PRINCIPAL AUTHORS OF THE 17TH AND 18TH CENTURIES—CLASSIFICATION OF GOUT ADOPTED BY DIFFERENT AUTHORS—AUTHOR'S DIVISION.

GOUT is a malady fairly entitled to boast of its great antiquity, as it was probably one of the earliest diseases to which flesh became heir when man began to participate in the luxuries of civilised life: it is a disease, also, which can lay claim to having had among its victims some of the most renowned of the human race, from their position, opulence, and intellect. The great Sydenham, often styled the English Hippocrates, himself a martyr to gout, thus alludes to those most liable to be affected by it:

"For humble individuals like myself there is one poor comfort, which is this, viz. that gout, unlike any other disease, kills more rich men than poor, more wise than simple. Great kings, emperors, generals, admirals, and philosophers, have all died of gout. Hereby Nature shows her impartiality, since those whom she favours in one way she afflicts in another—a mixture of good and evil pre-eminently adapted to our frail mortality:

'Nihil est ab omni
Parte beatum.'"

Among nations in an uncivilised state, living chiefly on the produce of the chase obtained by personal exertion, or subsisting on the simplest fare, gout, according to the reports of eminent travellers, is entirely unknown; but in our own country, and in many other parts of the civilised world, the case is far otherwise; for not only is gout in its most marked and typical manifestations exceedingly prevalent, but in its lurking and undeveloped forms it is probably still more so, and exercises a considerable influence over the character and progress of other disorders.

It is therefore obviously a matter of the highest importance that the disease should be clearly understood in all its bearings.

A further reason for the necessity of an accurate study of gout, is the fact, that errors in distinguishing it frequently occur, not only as regards its less marked forms, but even its most common manifesta-

tions. It is by no means rare, to hear of inflammation of a joint by one practitioner, called gout, by another rheumatism, and by a third, rheumatic gout; and such discrepancies of opinion, of the highest importance in treatment, often arise from the difficulty of clearly distinguishing its true character on account of our imperfect knowledge of the malady. As we proceed, we shall be able to demonstrate beyond doubt, that gout is a disease *sui generis*, having a pathology of its own, and producing alterations in the various tissues which it attacks, differing from all other changes,—alterations, indeed, which are completely pathognomonic.

If difficulties arise in distinguishing the more regular forms of gout, they are greatly increased when its irregular manifestations require to be discriminated. Although in a highly gouty state of the system, functional disturbance of various organs, and even inflammatory affections may and do arise, depending upon such morbid state,—conditions whose real nature it is most important to determine accurately,—still in practice, even at the present day, the term *gouty* is not unfrequently applied, more to quiet the patient and satisfy the mind of the physician, than from any evidence that the disease under consideration is strictly connected with gout; for it must be remembered, that the occurrence of gout does not ensure exemption from any other malady, and the latter, when it arises, has no necessary relation to the former. A careful perusal of the writings of some of the authors of the

last and commencement of the present century, must convince every thinking mind that many of the forms of gout so elaborately described, especially by Continental physicians, have no real existence in nature.

It will be one object of the present treatise, to endeavour more clearly to point out and separate those affections which are distinctly traceable to the gouty diathesis, to found their diagnosis on a more philosophical basis, and thus to pave the way for a scientific and successful treatment.

That the ancients were fully cognisant of the phenomena of gout, and in fact that it was one of the disorders the nature and treatment of which were best known to them, is at once evident from a perusal of their writings. It is true that an undue stress was frequently laid upon the mere seat of the affection, and that various names were not uncommonly applied to the same disease in its different local manifestations, and also that the same name was often given to maladies of a very diverse character; but this should not surprise us, considering their total ignorance of even the rudiments of some of those sciences which are essential to a clear understanding and separation of different pathological conditions of the body. Gout and rheumatism were doubtless at times confounded with each other by the Greek physicians, a remark also applicable to some pathologists of the present day; however, although the same general term was applied to both diseases, still it is manifest that true gout was mostly separated from other joint affections,

its peculiar phenomena and progress clearly defined, its various causes ascertained, and its treatment, dietetic and medicinal, carefully laid down.

The Greek physicians gave different names to the affection, according to its situation; for example, when the foot was attacked, it was named Podagra (*ποδάγρα*, from *πούς*, the foot, and *ἄγρα*, a seizure); when the hand, Chiragra (*χειράγρα*, from *χείρ*, the hand); when the knee, Gonagra (*γονάγρα*, from *γόνυ*, the knee); when many joints were simultaneously affected, the term Arthritis (*ἄρθρον*, a joint) was more commonly applied. The word gout appears to have been introduced into medicine about the end of the thirteenth century, by Radulfe, and it probably owes its origin to the idea which has been very prevalent in all ages, that the disease is caused by the presence of some peculiar humour in the blood, which is thrown out, or, as it were, distilled into the joints drop by drop; and hence in different modern languages terms expressing the same notion are employed, terms in fact corresponding to our word gout; thus, by the French the disease is called "Goutte," by the Germans "Gicht," by the Italians "Gotta," and by the Spaniards "Gôta," and so forth.

The writings of Hippocrates, who lived about 350 years before the Christian era, show that he was well acquainted with gout, and many of his aphorisms indicate the possession of a considerable knowledge of this disease. We find it stated, for example, that gouty affections are most troublesome in spring and

autumn; that women do not have gout until the catamenia have stopped; that young men are free from the disease till venery is indulged in, and that eunuchs are exempt from gouty affections. It is likewise affirmed that gouty patients who have chalk-stones in their joints, and have led a hard life, are beyond the power of medicine, but that under other circumstances the disease may be cured by the skilful physician. He considered the disorder as dependent on the retention of humours, and advised purging, and the application of cooling agents, even going so far as to pour cold water on the inflamed foot. Although we cannot subscribe to all that Hippocrates advanced, still we must agree in his general truthfulness; and it must be borne in mind that some of his aphorisms were more correct at the time they were enunciated than at subsequent periods, as luxurious habits had not then been so freely indulged in.

Celsus, about the beginning of the Christian era, in speaking of the treatment of gout, remarked that bleeding at the commencement of the attack had the effect of causing some patients to be free from the disease for a year, some even for life; he also recommends either cold or warm applications, depending on the presence or absence of inflammatory action. He, however, enjoins some caution with regard to the appliance of cold, and recommends a regulated manner of living and the avoidance of corpulence. With regard to the value of exercise, he remarks, "it is very necessary that those who are troubled with nervous pains,

such as happen either in the gout of the feet or hands, should give the parts affected as much exercise as possible, and should expose them on all occasions both to fatigue and cold."

Galen, who lived about the latter half of the second century, was of opinion, that gout was caused by some unnatural accumulation of matters in the part affected; these matters were supposed to consist of phlegm, bile, blood, or a mixture of these fluids, and chalk-stones were considered to be formed by such becoming concrete or solidified. In his comments on the aphorisms of Hippocrates, he remarks, that though in the time of Hippocrates eunuchs were not afflicted with gout, yet they were then in consequence of too much sloth and intemperance. Galen's method of treatment consisted in bleeding and purging, and the application of repellents and discutients.

Seneca, in his epistles, alludes to the influence of change of manners and habits, as exemplified during the Roman Empire, on the liability to certain diseases. He says: "The nature of women is not altered, but their manner of living; for while they come up to the men in every kind of licentiousness, they equal them too in their very bodily disorders. Why need we then be surprised at seeing so many of the female sex afflicted with gout."

Aretæus, the Cappadocian, who probably was a contemporary of Galen, and flourished about the middle of the second century, classified all joint affections under the term Arthritis, yet subdivided them, accord-

ing to the parts attacked, into Podagra, Chiragra, and so forth. That he had a very clear conception, and was familiar with many of the phenomena of true gout, is evident from his account of the manner in which it makes its invasion. He remarks that the pain first seizes the great toe, then the forepart of the heel on which we lean, next the hollow of the foot, afterwards the ankle; he also states that a wrong cause, as the friction of a new shoe, a long walk, a blow, or being trod upon is often assigned, and that patients are unwilling to recognise the true one. He goes on to relate that sometimes the disease is confined to the feet during the patient's life, but that it often extends to the hands, elbows, knees and even the hips, and other joints; that fluid deposits are formed which at last become converted into hard white tophi. It is also noted by this writer, that men are more frequently affected than women, and at the same time more slightly (this last statement, as far as real gout is concerned, is certainly erroneous); that the most common age is thirty-five, but that it may be sooner or later according to the temperament of the individual: as to the nature of the disease, Aretæus says, none but the gods can truly understand it. With regard to his treatment of gout, the following summary contains all that is important. White hellebore is the great remedy, but only in the early attacks. As local applications to the inflamed joints, he advises fresh-shorn unscoured wool from the sheep, and the parts to be bathed with oil of roses and wine; poul-

tices and other warm agents are likewise recommended to be occasionally used. He further adds, that the remedies for the disease are innumerable, for the calamity renders the patients themselves expert druggists. Aretæus considers that although the disease is apt to return and become chronic, still it is not always so, and he mentions that a gouty patient has, during the interval of the disorder, even won the race in the Olympic Games.

Cælius Aurelianus looked upon gout as hereditary, and upon indigestion, intemperance, cold, debauchery, and injuries, as the principal causes; that the symptoms usually attending persons afflicted with the diathesis, or those preceding an attack, were a numbness and pricking in the affected joints, difficulty in flexing and extending them, heaviness, great aversion to employment, feeling of great fatigue from the least movement, starting of the limbs during sleep, and shivering, until the morbid humour at last discharged itself upon one or other of the feet. He was of opinion that the disease was chiefly seated in the tendons and ligaments, and for treatment advised the abstraction of blood from the affected parts by scarification, as less irritating than cupping or leeching, and recommended sponging with hot water, or oil and water, or decoction of fenugreek. As a rule, he considered that powerful purging and vomiting were injurious, and altogether was inclined to be sparing in the use of remedies; he was, however, rigid as to diet, advising great abstinence at the commencement of an

attack, and a spare diet on its decline; he also advocated the free use of exercise.

Alexander Trallianus, who wrote in the sixth century after Christ, considers that, as there are many causes, so likewise there are many varieties of gout; that sometimes it is occasioned by blood flowing into the joints and causing violent pains; at other times by bile getting between the tendons and ligaments; and now and then by the presence of other morbid fluids. He gives methods of diagnosing these supposed varieties, and details their treatment at some length; when the disease is dependent on an overflow of blood, bleeding is ordered, but not otherwise; food capable of producing blood is forbidden, and strict temperance enjoined. He states that he has known some patients to have been cured by altogether abstaining from wine. Purgatives are prescribed, especially combinations of scammony, colocynth, elaterium, and aloes, also the hermodactylus, a variety of colchicum, the prejudicial effects of which are ordered to be obviated by combining it with aromatics, as myrrh, anise, pepper, cinnamon, ginger, and mastich. Bitters of various kinds are also recommended, amongst which is the birthwort, afterwards so much used in the celebrated Portland powder. Amongst local applications, we find sinapisms and blisters advised, as well as repellent lotions; and for the treatment of chalk-stones, ointments containing oil, turpentine, ammoniacum, dragon's blood, and litharge.

Aëtius, who also lived at the end of the fifth or

beginning of the sixth century, considered gout hereditary, and dependent on local debility, combined with a superabundance of humours; that it was most appropriately treated by first evacuating the latter by means of bleeding and purging, and afterwards strengthening the former. He also attributed great efficacy to the use of friction in gout, not indeed during the severity of the inflammation, but when this had to a great extent subsided; he employed oil mixed with salt as an external application.

Paulus Ægineta likewise considered gout dependent on two combined causes, weakness of the affected parts with morbific humours, the latter fixing themselves upon some of the joints already weak, and by stretching the ligaments, producing pain. Ægineta regarded gouty and rheumatic, or arthritic complaints, of the same nature, but differing in the seat of the affection; that when it was located in the feet only it was called Podagra, but when extensively diffused over many joints, Arthritis; he also thought that the abnormal humours might vary in character, and when they became thick or viscid, tophi or chalk-stones were formed. Among the causes of the disease he enumerated immoderate labour, violent walking, frequent exercise on horseback, the unseasonable use of venery, cold drinks, eating unwholesome food, and drinking much wine; and he remarks that occasionally accidents, as blows or sprains, have induced the first attack, the materials of the disease having previously remained quiet in the system. Sorrow, care, watch-

fulness, and other passions of the mind, are also looked upon by him as occasional causes of gout.

In the middle or latter half of the thirteenth century, Demetrius Pepagomenos wrote a treatise on gout, dedicated to the Emperor Michael Paleologus. He considered it to be occasioned by a collection of humours taking place in the affected joint, arising from imperfect digestion and deficient excretion from the system: the predisposing causes being excess of food and wine, indolence, indigestion, retention of natural secretions, and debility from over-exercise, fatigue, and too great indulgence in venery. These last operate by diminishing the excretory powers of the system, and hence allowing undue accumulations to ensue. His treatment is both dietetic and medicinal: the former consisting in avoiding indigestion, and exercising great moderation both in eating and drinking; the latter being chiefly of an evacuant character, either vomiting or purging. During the early stage of a fit of gout, venesection is recommended, especially when the patient is plethoric. The virtues of the hermodactylus combined with aromatics are much lauded, and regarded as valuable, whatever may have been the cause of the disease.

Dr. Adams, in his valuable notes appended to the translation of Paulus Ægineta, gives the following sketch of the views of the Arabian physicians. Serapion strongly recommends purging with myrobalans, prunes, and tamarinds; Avicenna and Rhases join him in praising the virtues of the hermodactylus. The

local applications of the Arabians are similar to those of the Greeks: when the pain is violent, Serapion approves of pouring cold water upon the affected part; Rhases of burning the joint in some cases; Avicenna of covering the part with oil and salt, and then of applying the cautery. According to Haly Abbas, arthritic diseases are due to collections of superfluities in joints labouring under debility, the superfluities being produced by repletion and indigestion; the debility by immoderate exercise, intemperance, debauchery, or some such cause. He states that young persons, and women who menstruate regularly, are scarcely liable to gout, and agrees with the authorities already mentioned in holding it to be hereditary.

When chemistry emerged from alchemy, and was first applied to the study of medicine, many opinions as to the nature of these morbid matters were promulgated; for some time they were regarded as being of a tartareous character, in many respects resembling the tartar which concretes in the wine casks. These views were held during the seventeenth and eighteenth centuries, until the discovery of the true nature of gouty concretions by Wollaston. M. Coste in his "Traité pratique de la Goutte," 1768, sums up the ideas commonly entertained as to the nature of the gouty matter. Some, he says, suppose it to be a mixture of various excrementitial humours, differing in their qualities and uses; others, a collection of foreign matters, altogether heterogeneous, and by their union capable of producing this malady; a third class

think it merely the perspiration arrested and decomposed; a fourth that it is a mucilaginous extract derived from the solid and liquid aliments taken into the system; and lastly, others assure us that it is a combination of many subtle and penetrating salts. Hoffman considered that a salt of tartar exists in the blood of the gouty, and constitutes the principal cause of the disease; to prove which, he cites several analyses of the concretions taken from the joints of gouty patients, as also of their excrements, saliva, and urine, and is persuaded that the tartar of wine is the essential matter of gout. M. Coste contends that Hoffman's opinion must be incorrect, seeing that gout follows almost all other ailments, and causes them to disappear, and hence from such reasoning, tartar must also be the cause of all these maladies,—an opinion, says he, manifestly absurd; and again he asserts, that gout is not uncommon among those who never drink wine, and who, therefore, do not take tartar; nevertheless M. Coste is inclined to think that it is one cause of the disease. During the two last centuries, the most important writers on gout were Sydenham, Willis, Hoffman, Musgrave, Cheyne, Boerhaave, Meade, Van Swieten, Cadogan, Forbes, and Heberden; but as we shall have occasion to refer to the writings of some of these physicians, and of the more recent authors of the present century, in other parts of this work, we shall content ourselves at present with the mere mention of their names.

In concluding our short history, we would refer such

of our readers as are interested in studying ancient authors to Lucian's famous comic poems, the Tragopodagra and Ocypus; in which many points connected with the nature and treatment of gout are very truthfully, though ludicrously, portrayed, showing that the knowledge of this disease was by no means inconsiderable in those remote times.

We have already alluded to the divisions of gout by the ancients, according to the seat of the affection, into Podagra, Chiragra, Gonagra, &c.; the more modern classifications which are worthy of notice are those of Dr. Cullen, Dr. Mason Good, Sir C. Scudamore, and Dr. Hamilton. Cullen divided the disease into four varieties, regular, atonic, retrocedent, and misplaced gout; Dr. Mason Good into three kinds, regular, disguised or lurking, and complicated gout; the late Sir Charles Scudamore into acute, chronic, and retrocedent gout; and Dr. Hamilton proposed a still more simple separation, namely, into acute and chronic gout. As forced attempts at subdivision and refinement tend rather to complicate than render clear the various phases which a disease is capable of exhibiting, I shall endeavour in the present treatise to simplify as much as possible, and for this purpose consider that the phenomena of gout may, for all practical purposes, be grouped under the heads of, 1st, *Regular Gout* (acute or chronic), consisting, for the most part, of a peculiar inflammation of the structures within and around one or more joints; and, 2nd, *Irregular Gout*, which may be manifested either in

severe functional disturbance of any organ, or in the development of inflammation in parts or tissues other than those connected with the joints: the last variety would therefore include the various forms classed by different writers under the heads of atonic, misplaced, retrocedent, lurking, abarticular gout, &c.

Many diseases which have been grouped under these various denominations have no claim to be considered truly gouty, being frequently but the secondary effects arising from alterations in organs, induced either by gout, or by the causes which have given rise to it.

Some objection may perhaps be made to the use of the terms regular and irregular gout, and it may be asserted, perhaps with truth, that its so-called irregular manifestations are in fact quite as regular as the articular affection; however, the terms are convenient, and the meaning to be attached to them has been sufficiently explained.

CHAPTER II.

ACUTE GOUT:—DESCRIPTION OF AN EARLY ATTACK—PREMONITORY SYMPTOMS—SEAT AND CHARACTER OF GOUTY INFLAMMATION—PART FIRST AFFECTED—PAIN—ŒDEMA—DESQUAMATION—NOT FOLLOWED BY SUPPURATION—APPARENT EXCEPTIONS—FEBRILE DISTURBANCE—PROGRESS OF GOUT—LESS COMMON FORMS—ACUTE GENERAL GOUT—SEQUELÆ OF ACUTE GOUT—OPINIONS AS TO THE DESIRABILITY OF THE OCCURRENCE OF GOUT—SYDENHAM'S DESCRIPTION OF ACUTE GOUT.

THE phenomena attending an acute fit of gout have been frequently and ably described, especially by Sydenham, who had, in this respect, the questionable advantage of being able to record what he himself both felt and observed. Although unable from personal experience to describe the sensations of gout, I will endeavour to depict the phenomena which have usually come under my own observation; the description referring more especially to the first, or, at any rate, an early attack of the disease, and one uninfluenced by the exhibition of medicines.

An individual, in apparently good health, perhaps even flattering himself that he feels unusually well, retires to bed; after a few hours' sleep (generally from one to four in the morning), he suddenly awakes, with a pain, more or less intense, in the ball of one great toe, frequently accompanied with a slight shivering;

the pain in the foot gradually increases, and is attended with a sensation of burning and throbbing, together with great tension and stiffness; some heat of skin and other symptoms of febrile disturbance usually follow the shivering, with a considerable degree of restlessness. After a few hours these symptoms somewhat abate, enabling the patient to enjoy a little sleep, and a gentle perspiration ensues. In the morning the toe is observed to be swollen, the skin of deep red colour, tense and shining, and the whole joint exquisitely tender; the veins proceeding from the inflamed part are distended with blood, producing slight lividity, and an appearance is exhibited closely resembling the drawing in Plate I. fig. 3, with the exception of the white spots, which in the delineated toe are due to deposits of urate of soda from oft-repeated fits of gout.

During the height of the attack the pain and sensibility of the affected part are usually most intense, to such a degree indeed, that the patient can neither bear the weight of the bed-clothes, nor even the shaking of the bed from footsteps in the room. After a few hours of torment the pain generally abates, but this is not always the case, for, if the attack be very severe, the symptoms may continue, though with less intensity till the evening, when they again increase, and the second night is passed in a state of renewed restlessness and suffering, which abate only with the dawn of day. The third evening the symptoms probably return, subsiding the

following morning; and thus the patient continues to suffer many days, occasionally weeks, the duration of the attack depending on various circumstances connected with the condition of the sufferer and the mode of treatment adopted, both as regards medicine and regimen.

At the time of the greatest febrile disturbance, the urine is usually scanty and high coloured, occasionally remaining clear, but for the most part giving rise to a dark reddish brown sediment on cooling. The appetite is generally impaired during the severity of the pain, but it may be as good as in health, nay, sometimes augmented; thirst is present when the inflammation is severe; the bowels are often constipated, and the patient liable to be affected with severe cramps in the muscles of the legs.

When the attack, or as it may be perhaps more properly called, series of attacks, is about to terminate, the inflamed part gradually becomes less tense and swollen, pitting is more readily produced by pressure, the redness and enlargement of the blood-vessels disappear, and after a few days, itching of the skin and desquamation of the cuticle ensue, the joint remaining more or less tender.

In the first fit of gout and frequently for many attacks, the ball of one great toe is the only joint implicated, but occasionally the inflammation suddenly leaves this toe, and the corresponding part of the other foot becomes affected; sometimes the inflammation travels so as to implicate the inner side of the

foot; but these instances form the exception rather than the rule, and will be fully described when we have occasion to dwell upon the individual symptoms. The above description refers more particularly to the first few attacks of gout in robust and otherwise healthy subjects, and may be taken as typical of *acute sthenic* gout; but now and then, especially among women, an acute fit may be wanting in many of these symptoms; there may indeed be pain and tenderness in the toe, and some amount of swelling, but accompanied with little heat or redness, and all febrile disturbance may be absent, still œdema is generally observed, and itching and desquamation follow; this latter form, which may be considered as representing *acute asthenic* gout, is doubtless of the same nature in its essence or pathology as sthenic gout, the difference depending rather on the character of the patient in which it occurs. Asthenic gout, although at first apparently mild, may ultimately prove more mischievous than the sthenic form, from its assuming a chronic type, and is often attended with consequences far more injurious than the severe and painful fits of genuine sthenic gout.

Prior to a first attack of gout there is generally an absence of any prominent premonitory symptoms, although disturbance of the function of some organ would probably have been observed, had the patient been narrowly watched for a few days preceding the fit; but in subsequent seizures there are usually uncomfortable sensations experienced for a short time pre-

viously, mostly referable to the digestive organs, as heartburn, acidity, flatulence, oppression and drowsiness after taking food, hiccup, scanty and high-coloured urine, but sometimes copious and pale, confined bowels, loss of appetite, lowness of spirits, and a feeling of lassitude. When individuals are liable to weakness or disturbance of any organ, symptoms referable to such are apt to manifest themselves; for example, some experience palpitation of the heart or intermission of the pulse; some are troubled with hæmorrhoids or irritability of the bladder; others are annoyed with excessive cramps and itching of the skin; the temper is often much ruffled, and the patient becomes peevish and irritable. If subject to bronchitis or any other chronic affection of the chest, an increase of cough and dyspnœa may precede a fit, and be greatly relieved on the occurrence of the gouty paroxysm.

Such are the symptoms which are commonly experienced, and may perhaps be fairly classed as premonitory of an attack of gout.

Having given a general sketch of a fit of gout presenting the principal characteristics of a typical attack, we will enter a little more fully into the consideration of the various phenomena previously alluded to.

The first point to be noticed is *the seat of the affection*. We have said that it is the ball or metatarso-phalangeal joint of the great toe, and unless there are circumstances in the case which have, as it were, thrown the disease upon some other joint, circum-

stances which we shall have presently more particularly to notice, true gout, at its first invasion, seldom attacks any other part, and even if another be first affected, the ball of one great toe is probably so likewise. Sir C. Scudamore drew up a list of 516 cases of gout, for the purpose of determining this point; and from this table we find that one or both of the great toes alone were affected in 341 instances, and the great toe with some other part in 373 cases. The details of the table are seen below.

In the great toe of one foot only	314
In the great toe of each foot	27
In the knee and great toe	1
In the little toe and one adjoining	1
In the great toe and instep	4
In the great toe and instep of each foot	2
In the great toe of one foot and instep of the other	1
In the great toe, instep, and ankle of one foot	1
In each great toe and each hand	1
In the external side of the foot and the great toe	1
In the external side of one foot and the great toe of the other	1
In the heel and the great toe.	2
In the ankle of one foot and the great toe of the other	5
In the ankle and great toe of the same foot	11
In the tendo Achillis and the great toe of the same limb	1
In the outer side of one foot	10
In the outer side of each foot	1
In the sole of the foot	4
In the heel of one foot	6
In the heel of each foot	2
In the heel and instep of the same foot	2
In the heel of each foot, in each hand and each elbow	1
In the ham	1
In the knee	11
In each knee	1

In the instep of one foot	25
In the instep of each foot	6
In one instep first, afterwards each knee, each wrist, each elbow, and each shoulder	1
In one ankle	36
In each ankle	11
In the ankle and instep of one foot	4
In the tendo Achillis	4
In the tendo Achillis and ankle	1
Calf of the leg	1
In the thumb, knee, ankle and great toe on one side, and lastly, the great toe of the other foot	1
In the right knee and left hand at the same time	1
In the back of one hand	4
In the wrist	4
Thumb and hand	1
In the thumb	1
In two middle fingers	1
In one middle finger	1
In the fourth finger	1

My own experience fully confirms the results of the above table, especially as to the frequency of the great toe being selected; and I am convinced that in many cases of joint affection, where difficulty would otherwise exist as to the precise nature of the disease, considerable light may be thrown upon the subject by directing attention to this fact; it appears remarkable that this particular joint should be selected by the disease upon which to vent its first fury; however, so it is; and when we shall again have occasion to recur to the point in discussing the nature of gout, we may possibly be able to give something like a rational explanation of this phenomenon. From an investigation of the history of a considerable number of cases of true

gout, I find that in not more than five per cent. were other joints stated to be implicated, to the exclusion of the great toe; and authors, both in this country and abroad, seem to be fully agreed upon the matter. In point of frequency in being attacked, the ankle seems to be second to the ball of the great toe, afterwards the instep, next the outer side of the foot, then the knee, &c.; whereas, the upper extremities are seldom implicated in the earlier attacks of the disease.

The extreme frequency of the affection first locating itself in the ball of the great toe cannot be looked upon as a mere fortuitous circumstance, but is intimately connected with the pathology of the disease; when deviations from this rule are found, they depend on peculiar influences which are then brought into operation, some possibly existing within the patients themselves, but perhaps more commonly arising from without; the most potent cause of such deviations is the occurrence, either at the time or on some prior occasion, of injuries, such as bruises or sprains. I possess Notes of cases more or less resembling the following: A gentleman, with a strongly marked hereditary predisposition to gout, hurt his knee from a fall when hunting; the pain was not very severe at first, but in the course of a few hours became intense, much more so than could be accounted for by the nature of the injury; it soon, however, became evident that the joint was affected with acute gout, which was speedily relieved on the ball of the great toe of the same side becoming inflamed. After two years, this

patient had a second attack of gout, which was then confined to the ball of the great toe. Sir C. Scudamore relates the following case: A gentleman, when a youth, accidentally received some small shots from a gun in one knee. They were removed, but the knee was rendered permanently weak; and to this injured joint gout, in after life, first attached itself, and always afterwards with more severity than any other situation. Many other examples might be quoted, illustrative of the influence of local injury in causing gout to appear in parts not usually first affected, such as the ankle, elbows, &c.; but as we shall again have occasion to refer to this subject when speaking of the exciting causes of the gouty paroxysm, we will content ourselves with the instances above given.

The *character of the inflammation* next deserves our attention. We have said that there is much pain, and there appears to be something peculiar about this symptom; it is often very intense, and differs considerably from that produced by injury; a gentleman for example, who broke his leg and then had a fit of gout in the opposite great toe, expressed his opinion that the pain of the latter far exceeded that of the former. Sometimes it is described as resembling the gnawing of the part by a dog, the dislocation or tearing of the joint asunder, and so forth. Dr. Watson, in his admirable Lectures on the Principles and Practice of Physic, gives the description by a humorous Frenchman of the distinction between the pain in this disease and in rheumatism: "Place," says he, "your

joint in a vice, and screw the vice up until you can endure it no longer, that may represent rheumatism; then give the instrument another twist, and you will obtain a notion of gout." Now and then, indeed, cases of gout are met with, in which the pain does not appear so intense, although the inflammation may run high, and I have known several first attacks of the disease in which this has occurred; they form, however, the exception rather than the rule.

The production of *œdema* of the gouty part, and the subsequent *desquamation of the cuticle*, is a peculiarity of gouty inflammation when it attacks superficial structures, and one deserving attention; for although it cannot by any means be considered as pathognomonic, still it is sometimes of considerable value in diagnosis. During the early stage of an attack, when the inflammation is violent and the skin distended and shining, the œdema cannot be readily observed, on account of the tension; when, however, the inflammation begins to subside, pitting can be easily detected and the presence of fluid made evident. As a rule, true rheumatic inflammation is not accompanied by œdema: but it now and then occurs in undoubted cases of the acute disease; it is, however, more general in character, affecting the whole limb, and not so strictly confined to the inflamed part, as in cases of uncomplicated gout. The desquamation of the cuticle is a subsequent symptom, taking place after the complete subsidence of the gouty paroxysm; it is most usually observed about the feet and hands, rarely in

the knees; it seems, as far as my own experience goes, to bear some relation to the amount of the previous œdema, and consequent distension of the skin; occasionally even the nails have been shed after a severe attack of gout: prior to and accompanying the desquamation there is often considerable itching; a symptom which follows other slight injuries to the skin, as the application of a blister. Sir C. Scudamore observed that in 234 cases, seventy-eight patients never experienced desquamation, and in my own Notes I find several in which this symptom is not mentioned; but it must be remembered that it is one readily overlooked, unless specially sought for. With regard to the cause of œdema occurring so frequently in gouty, compared with other forms of inflammation, nothing very satisfactory has yet been made out: may it not depend on the impurities in the blood? May not the presence of urate of soda and a small amount of urea in that fluid, be at least one cause? As we proceed we shall discover that the blood in gout differs much from that in rheumatism, especially as regards the presence of these excrementitial matters.

Upon the *temperature of the parts affected* with gouty inflammation, there is nothing of importance to remark; patients often express themselves as suffering from intense heat of the joints, but the thermometer shows no greater increase of temperature than is ordinarily found in many other forms of inflammatory disease; the extraordinary sensation of heat, therefore, which is sometimes felt by the gouty, must arise,

not alone from increase of temperature, but from a peculiar exaltation and perversion of the nervous function.

Gouty inflammation differs from common phlegmonous inflammation in some other important points, and more especially in *not being followed by suppuration*. If a medical man, by chance entirely ignorant of the nature of gout, were to see a toe affected with this disease in its full intensity, swollen, hot, red, and tender, he would probably think that the affection must of necessity terminate in suppuration; yet I believe this never happens as the result of simple gouty inflammation. I have, it is true, seen cases which at first appeared to favour the idea that suppuration sometimes thus occurs; but, on further investigation, in each instance the formation of the matter could be otherwise satisfactorily accounted for.

The following case illustrates these remarks. A man, C. F., was attacked with a violent fit of gout, affecting many joints, and, among others, the first phalangeal joint of the right index finger; the swelling rapidly increased, was accompanied with much pain and redness, and in the course of four days gave distinct evidence of the presence of fluid; a small puncture was made with the point of a lancet, and a drachm or more of a milky-looking liquid escaped, containing pus globules, mixed with numerous crystals of urate of soda aggregated in small masses. It was afterwards found that deposits of this salt had previously existed in the part, and the suppuration was

doubtless owing to the inflammation occurring around a foreign body. Sir C. Scudamore states in his work, that he only found suppuration in eight cases, and noticed that in each instance the result was curiously modified by an attendant secretion of urate of soda: I believe that in all of them, had they been specially examined, it would have been found that urate of soda was previously present in the tissues, as the result of former attacks. I have never witnessed, and am not aware of there being an example on record of a *first fit* of gout, however intense, being accompanied with the production of pus.

I believe it may be considered as the rule, that in acute gouty attacks the amount of *febrile disturbance*, as indicated by the rapidity and force of the pulse, the increased heat of surface, thirst and loss of appetite, bears a close relation to the extent and severity of the local inflammation; that the fever is, in fact, chiefly symptomatic, and differs greatly from that which occurs in acute rheumatism, when the highest febrile disturbance may exist without any proportionate inflammation of the joints. Although the skin is frequently moist during an attack of acute gout, still the profuse and peculiar sweating so commonly met with in rheumatism is never present.

The following cases illustrate the close relation existing between the febrile disturbance and the amount of local disease.

January, 1855.—H. C., ætat. 32, had his first attack of gout, when 28 years of age, confined to the ball of

the left great toe, which was hot, swollen, and painful, afterwards pitting freely on pressure, and giving rise to desquamation of the cuticle. For two years after the first fit he had a return each year about Christmas; but within the last two years, an additional one in the summer. The fits gradually increased in severity, and the number of joints implicated became more numerous at each visitation. When first visited, the ball of the left great toe, instep, and ankle, were swollen, hot, and painful; with the corresponding parts on the right side, although in a less degree; the wrists, hands, and elbows were much inflamed, and the knees were slightly affected.

This case affords an example of acute gout affecting *many* joints, and the febrile disturbance will be seen to be of corresponding intensity: the pulse for example was hard and full, 108; the skin hot and dry; the tongue furred, with much thirst. After a few days' treatment, the joints were relieved, and the pulse became soft, and only 74 in the minute.

The next case presents an example of the acute affection in which *one* joint only was implicated.

November, 1854.—J. P., ætat. 44, had his first attack of gout at the age of 40; the second, two years afterwards, the present being his third fit. Is now complaining of great pain in the ball of one great toe, which is much swollen, hot, red, and pitting a little on pressure. Tongue furred, and slight thirst. Pulse 78, and no other symptom of fever.

It will be commonly found that in cases of gout,

when but few joints are affected, the pulse, if not quickened by the intensity of the pain, is but little accelerated, nor are the other signs of febrile disturbance at all prominent; much stress cannot be laid upon the condition of the tongue, as this depends greatly upon the state of the patient's stomach and bowels, organs frequently deranged in gouty individuals.

Having shown the most important phenomena usually attendant upon a first or early attack of gout, we will next endeavour to trace the further progress of the disease. Occasionally a patient experiences but a single attack of gout, but this rarely happens if his life is prolonged; commonly the disease returns after an interval more or less lengthened, depending on the patient's constitutional tendency, his mode of living, and the amount of predisposing and exciting causes to which he is subjected. Several years sometimes elapse between the first and second fit; frequently two years, more often one, now and then but a few months respite is afforded; as the disease becomes grafted into the constitution, the attacks are frequent, and at the same time more general in their character. When gouty patients live within moderate bounds, and when the hereditary predisposition is not very great, the disease may be confined to the ball of one or other great toe for several attacks, or even for a period of many years, but the tendency of the disorder is to travel upwards, affecting first the ankles, then the knees, and afterwards the hands and elbows, and still

later the joints of the upper extremities. So frequently is this order of succession met with in true gout, that the history of a case will often serve as a guide in arriving at a correst diagnosis of the disease.

My Note-books afford numerous illustrations of what I have now stated; it will be sufficient, however, to give shortly the details of the time and situation of the attacks as they occurred in a few instances only.

1857.—C. M., ætat. 55 years, not inheriting gout from either father's or mother's side, but having a brother slightly affected with it. Fifteen years ago he remembers going to bed quite well, and about four o'clock in the morning waking up with pain and stiffness of the ball of the right great toe, which soon became hot and swollen. The fit lasted about three weeks, and no other joint was implicated.

The second fit occurred at the end of a twelve-month, affecting the same joint, at the same time in the morning, and lasting altogether about a fortnight. For the next six years, the attacks occurred annually, and were confined to the metatarso-phalangeal joint of one or other great toe.

Six years ago, the upper extremities first became implicated, the disease attacking the wrists, knuckles, and phalangeal joints; the paroxysms usually lasted about fourteen days, and were followed by desquamation of the skin. Until within the last twelve-months the fits have returned uniformly at the same time of the year, but since that period they have been more frequent and uncertain.

It is indeed astonishing to find how regularly, in some instances, the returns of gout occur, for not unfrequently patients are able to calculate the time, even within a few days.

The following case is an example in which for many years the intervals between the attacks were long, and, at the same time, very regular.

1861. A gentleman aged 49 years, who cannot trace gout to any of his ancestors, but who has always lived well and partaken freely of malt liquors and wine; with the exception of gout has always enjoyed good health. His first attack occurred ten years since, and was confined to the ball of the right great toe; two years afterwards, the same joint was similarly affected; two years again elapsed between the second and third fits, and a similar interval between the third and fourth; the disease being as yet confined to the one toe. In the year, 1858, the left great toe and instep were affected, and in 1859, the right toe was again selected; in 1860, both great toes were implicated consecutively. After this, gout became more frequent, and within the last six months he has suffered from three attacks, sometimes in one foot, sometimes in both, but the knees and upper extremities have remained free. The urine is usually clear, containing no albumen, and gives rise to a very moderate deposit of uric acid on the addition of a foreign acid.

I may add, that under treatment this patient soon became free from gout, and has remained so for a period of nine months, having passed through a severe

ordeal during the autumn and spring. The long intervals which occurred so repeatedly in the above case, may be explained by the absence of any hereditary predisposition, the possession of a good constitution, and the age of the patient, and the check given to the progress of the disease is due not alone to medicinal treatment, but to abstinence from the chief predisposing and exciting causes.

The next case illustrates among other points, that sometimes very long intervals may occur.

Oct. 1861. A gentleman, ætat. 50, inheriting gout from father, had his first attack when somewhat young, in one great toe; after many years the second fit occurred in the same joint; then, after an interval of four years a third, and a fourth about three years afterwards, and so on for six or seven attacks; up to this time the disease had been mild, of short duration, and had confined itself to the feet with one exception, when the knuckle of the index finger of one hand was implicated. In July of this year a more severe attack came on, first in the left heel, then in the left great toe; afterwards in the right great toe, and during August the same succession was repeated; in September, the heel was for the third time affected and one toe; he has now scarcely recovered. No dyspeptic symptoms are present during the gout or in the intervals, but the patient is subject to cold extremities and shows other evidence of a feeble circulation: is very careful as to diet, takes a little claret and at times cider, but no malt liquors. It would appear

that hereditary tendency is the chief cause of gout in this instance, and the lengthened intervals may be attributed to the careful manner of living; however, at the age of 50 years, the disease is apt, unless checked, to become more firmly rooted in the system.

The last case is an instance of the opposite kind, in which the attacks of gout from the first came on with great rapidity.

1862. A gentleman, aged 40 years, having no known hereditary predisposition to gout, and never having indulged to any extent in alcoholic beverages, was first attacked in April, 1861, in the ball of the right great toe, which was swollen and painful, the attack lasted about a fortnight, during this time the left toe was somewhat implicated. Three months subsequent to this the second fit occurred; four months afterwards, the third, and the fourth after an interval of two months only, in all of these attacks, the disease was confined to one or other of the great toes. It is difficult to divine the cause of this rapid development of the affection, as the kidneys appear to be free from disease, and no marked dyspeptic symptoms have been observed.

Although it generally happens that the great toe is first affected in gout, or at least becomes implicated during the progress of the fit, this is not invariably so, and we must by no means conclude that a disease is not gouty, simply from the absence of the toe affection; for now and then striking examples present themselves of genuine gout, the great toe during the

whole time remaining quite free: these cases occasionally offer considerable difficulties in diagnosis, and their careful study is of much importance. The following is an instance:—

October, 1858.—H. P., a male, aged 38, came under my care in the hospital, on account of severe suffering in both ankles. It appeared from the history of the case, that his father had been greatly afflicted with some joint disease, to such an extent as to cause him to be bedridden for sixteen years; it was considered to be rheumatism. The patient, when fifteen years of age, had an attack of what appeared to be rheumatic fever, affecting the wrist and other joints of the upper extremities; seven years afterwards, he had a second of similar character, but implicating the lower extremities also. From this time to his admission, he had suffered at four or five different periods, the disease generally assuming a chronic form, and rendering him helpless for many months. He cannot remember that the ball of the great toe was ever implicated. By occupation he is a cellarman, and is exposed to cold and damp; he takes on an average each day, at least four pints of pale ale or other malt liquor, and sometimes a considerable amount of wine. On admission, three weeks after the commencement of the attack, both ankles were painful and tender, but not swollen or red; he was unable to flex them, and the least attempt to do so was accompanied with much pain; pulse 72; tongue slightly furred and no thirst; appetite moderate; bowels regular; no perspirations; the

pain in the joints somewhat increased at night. The urine scanty, sp. gr. 1030, giving rise to some crystalline deposit of uric acid on standing; no albumen present.

As there was some doubt as to the real nature of the disease, about two ounces of blood were taken from the arm, and the serum exhibited the presence of a moderate amount of uric acid when treated by the thread experiment detailed in a subsequent chapter.

The patient was put upon middle diet, and a few grains of iodide of potassium ordered; but after four days his condition remained the same, with the exception of a slight alleviation of the pain in the joints, probably due to the perfect rest and regulated temperature enjoined. It being found upon inquiry, that he had usually taken pale ale in preference to porter, considering it better adapted to his disease, and as he thought he felt more pain in his joints after taking stout, and, moreover, as the examination of the blood had shown the existence of an abnormal quantity of uric acid, I deemed it advisable, in order to arrive at a correct diagnosis, to see the influence of a change of diet upon the patient. For this purpose, as his appetite was good, the extra full diet of the hospital was allowed, with the addition of two pints of porter, medicine being omitted. For the next four days all went on satisfactorily, but on the fifth he complained of severe pain, first in the right and then in the left ankle, which soon became swollen and red, and two

days afterwards pitted freely on pressure, and gave rise to desquamation of the cuticle; the tongue was furred, pulse above 100, but no marked thirst. The porter and meat were then discontinued, and a draught containing half a drachm of colchicum wine in camphor mixture, administered three times a day. Within forty-eight hours, the ankles were greatly relieved, and in a few days quite free from swelling or redness, and altogether in a much healthier state than since the commencement of the attack; the colchicum did not produce either nausea or looseness of the bowels.

Why the great toes escaped in this case it is difficult to determine. May not the acute rheumatism in early life have left a certain amount of alteration in the larger joints, predisposing them to become affected by the gouty poison? We know that after accidents the weakened parts are more susceptible of its influence.

In this case no deposits of gouty matter could be discovered, but the first phalangeal joint of the right little finger was flexed and almost anchylosed, whether or not by the deposition of urate of soda in and around the joint, it is impossible to decide; however, the character of the inflammation, the condition of the blood, the influence of diet, and the striking effect of colchicum upon the disease, leave no doubt that the case was one of true gout; and there can be no reason why a patient, who was in early life subject to rheumatic fever, should not acquire in after years the gouty diathesis. Several instances have recently occurred in my practice of the absence of great toe

affection in cases of most unequivocal gout, and I am inclined to think that they are found more frequently in the upper classes of society, among those who inherit gout, but have not indulged freely in the pleasures of the table. Occasionally we find sufficient reasons for the exemption of the metatarso-phalangeal joint, which we shall again have an opportunity of discussing.

We have said that gout in its early attacks ordinarily selects one, or at most only a few joints, and that the smaller articulations are more particularly fixed upon; exceptions to this law are now and then met with, in which not only are the larger joints implicated, but the number affected increased, and there is often much difficulty, at least at first, in making a correct diagnosis, as they closely resemble cases of acute rheumatism; a very remarkable instance of this form of acute general gout came under my care a few years since, in which the subsequent phenomena left no doubt of its true nature.

December, 1853.—C. F., a man aged 35, was brought to the hospital under the following circumstances. He had on the previous day been struck in the infra-axillary region by the shaft of a cart, which had knocked him down and fractured one or more of the left ribs. He was admitted into a surgical ward, and as there was evidence of some small amount of traumatic pleurisy, he was ordered to be cupped over the chest, and to take three-grain doses of blue pill and half a grain of opium every three hours. In the

evening he felt pain in the left elbow-joint, and during the night the fingers of the same hand became red and swollen, in addition to which the soles of the feet and right knee were involved. As the case assumed more of a medical than surgical character, the patient was next day (two days after the injury) transferred to one of my wards, when his condition was a follows:

Countenance pale and sallow; pulse 108, rather small, but hard; skin hot and somewhat moist, tongue furred, gums red and swollen, and breath mercurial; much thirst and loss of appetite. The joints affected were the left wrist, hand, and elbow, which were hot, red, and swollen, likewise the right knee and ankle, and little toe of the left foot. A friction sound was heard from the middle of the left back of the chest round to the axilla.

The next day most of the inflamed joints pitted distinctly on pressure, and the middle joint of the right index finger was much swollen, the circumference being at least twice that of any other; the skin also was very hot and red, and the whole finger exquisitely tender and painful. On the following day the condition of the patient was much the same. Up to this time the patient had been looked upon as suffering from acute rheumatism, and the treatment had been such as is usually adopted for this disease, but I now suspected that my first diagnosis was faulty, and that the case was one of genuine acute gout; my reasons were as follows—*First*, the blood drawn by cupping

from the chest was found on examination to be rich in uric acid; *secondly*, the character of the inflammation was such as usually occurs in true gout and rarely in rheumatism, the more important points being the shining appearance of the inflamed skin and the subsequent pitting on pressure; *thirdly*, the fact of the patient being so readily affected by mercurials—an occurrence by no means uncommon in gout, but rare in rheumatism; and *lastly*, I was assured that the patient was labouring under acute gout, from the future progress of the case. In the course of a few days the swelling of the right index finger increased to such an extent as to present the appearance of intense distension, and to give rise to fluctuation; at the same time the other joints were much relieved, and the febrile disturbance had abated under the influence of the colchicum administered. Shortly afterwards, on puncturing the distended skin of the finger, a milky fluid exuded, which, under the microscope, was found to owe its opacity to innumerable crystals of urate of soda, in the form of very fine needles (Plate 5, fig. 3). On making further inquiries into the history of the case, I ascertained that this was not the first attack of joint affection he had experienced, for about fifteen months previously he had laboured under some inflammation of the foot, with the characters of ordinary gout. In the course of a few weeks the nature of the case was still more clearly established, from the fact that a small deposit of urate of soda occurred in the helix of one ear; and

since that period, now about seven years, chalk stones have formed in different parts, and gouty symptoms have from time to time exhibited themselves in their ordinary type, in the great toe and elsewhere. The patient was a painter by trade, had drank about a quart of porter each day, and appears to inherit gout from the mother's side: two of his brothers have since been my patients, suffering from the same disease.

Many cases of acute general gout, more or less allied to the one just quoted, have been described and regarded as attacks of acute rheumatism. I am inclined to think the following, which is classed as one of acute rheumatism developed during an attack of acute gout, is an example of this fact; it is related by Mr. Spencer Wells in his interesting work on this subject:—"A gentleman about forty years of age, descended from gouty parents, and accustomed to indulge rather freely in the pleasures of the table, about five years ago had a slight attack of gout under the ball of the right great toe. This soon went off, but at intervals of three or four months similar attacks had recurred, their severity and frequency both being on the increase. One evening he felt that an attack was threatening, but he attended late in the House of Commons, and, as the pain was increasing, he thought a day's exercise would probably ward off the attack, as he had found it do so before. Accordingly, on leaving the House, he posted all night between seventy and eighty miles to have a day with his hounds. He arrived but just in time to equip for the field, and had

one or two short runs and a very long one, in the midst of the rain on a cold day. He had to ride fifteen miles on a tired horse, on returning, and when he reached home had to be lifted from the saddle and carried to bed. He took hot brandy and water, but a severe rigor came on, and a general attack of acute rheumatism set in on the following day. It was so severe that the gouty inflammation of the foot was disregarded, attention being given to the state of the heart and general condition. In about a fortnight he was convalescent, so far as the rheumatism was concerned, but the gouty action continued in the foot, and did not disappear until a few doses of colchicum had been given." Another case from the same author, and considered to be likewise one of acute rheumatism in a person affected with chronic gout, is as follows: "A gentleman affected with chronic gout, having considerable deposits of lithates in the fingers and around the ankles, and being subject to copious urinary deposits of varying composition, passed some time in Malta to obtain the advantages expected from living in a warm climate. After a very hot day he remained in a boat in the harbour, fishing, for some hours, on a moonlight evening. He had been perspiring freely in the afternoon, and was lightly dressed. He felt rather chilly before he went home, had a severe shivering fit in the night, and was confined to his bed for twelve days with a smart attack of acute rheumatism affecting the knees, shoulders, and loins, but not any of the joints which had previously been affected by gout."

That many cases of acute gout have been mistaken for acute rheumatism, I do not doubt, and on the contrary, that some few cases of acute rheumatism have been regarded as of a gouty nature, I am no less certain; I may refer to the oft-quoted case by Dr. Haygarth, in which gout is supposed to have been transferred from the extremities to the heart, as an example of the latter error.

The early attacks of gout are not usually followed by any very appreciable evil consequences, and as one of the effects of a severe paroxysm is to rid the blood of the impurities which had probably been lurking there for some length of time, it is not uncommon to hear patients express themselves as even benefited by the occurrence of the gouty fit. Gout, on this account, was formerly looked upon as a salutary disease, and one capable of removing all others; but the error of this opinion can be now readily demonstrated, and we shall be able to show that every attack is attended with permanent local mischief, which, though slight at first, may, by frequent repetition, be sufficient to induce serious inconvenience. This opinion as to the advantages of gout is now fast wearing out, even amongst the public; intelligent physicians have long exposed its fallacy, and have combated it, as shown by the following extracts from Heberden's Commentaries, and Coste's Traité pratique de la Goutte. Heberden's remarks are to this effect, that although some patients congratulate themselves upon the completion of their wishes, and during the honeymoon of the first fit of

gout dream of nothing but perfect health and happiness, and persuade themselves that they are much the better for it, still this is the exception rather than the rule; for he states that he had often seen gout arising during the progress of other diseases without giving relief, and that the number of cases in which it has produced increased mischief was double that in which it had befriended the constitution. It is true that other disorders will at times be suspended upon an attack of gout as upon the accession of other acute diseases, but at other times no such result follows. Heberden states that if gout return but seldom it may do but little harm; but so may epilepsy occur once a year, yet the patient live to a good old age.

M. Coste writes to this effect:—"A popular error, which I wish to expose in a few words, is this prejudice, which has already lasted more than two thousand years, and which has reached even the thrones of princes, where the disease commonly shows itself, viz., that gout prolongs life (*que la goutte prolonge la vie*). This error," says he, "has taken the surest method of introducing itself, by making flattering promises, by persuading its victims that there is a singular advantage in having gout, and that the malady drives away all other evils, and that it ensures long life to those whom it attacks."

It occasionally happens that a patient fails for a long period to get rid of the ill effects of an attack of acute gout, for the affected parts may remain very tender for a long period of time, although no appre-

ciable structural mischief has taken place; and sometimes there is a considerable tendency to edema, more especially if the fit has been of long duration. A case occurred in my practice a few years since, bearing forcibly upon this point. A gentleman enjoying good health, with the exception of occasional attacks of gout, consulted me on account of some swelling of the feet and ankles, remnants of the last fit of the disease. Up to the period of the last attack he had been accustomed to apply to his usual medical adviser, and was generally restored to health in about ten days or a fortnight, but in the last attack he had been persuaded to put himself under the treatment of a homœopathic practitioner, and had complied strictly with his injunctions regarding both medicine and regimen. At the end of the fortnight instead of finding himself well, as had formerly been the case, the disease was still present in its full intensity; he was, however comforted by the assurance that, although the cure might be slow, yet it would be the more complete, and thus he continued to bear his sufferings for seven weeks, until the affection had fairly worn itself out; but it had left, as sequela, considerable tenderness of the structures which had been inflamed, and well-marked edema, symptoms for which he was desirous of obtaining my advice. On examining the urine, it was found free from even a trace of albumen, and the only cause which could be assigned for the swelling was great weakness of the blood vessels, the result of the prolonged inflammation. Treatment adapted to remove

any remains of gout, together with the use of the elastic stocking, proved sufficient for the cure. This case is a good illustration of the fact that, even with great care as regards diet and regimen, gout may prove extremely tedious, and we shall be able to prove that such duration is attended with the production of serious mischief, and should be curtailed when possible by the application of appropriate remedial measures; those who have had many opportunities of witnessing the progress of gout will not, I believe, be inclined to agree with Cullen's aphorism: "The common practice of committing the person to patience and flannel alone, is established on the best foundation."

Although the earlier attacks of gout are usually unattended with any great amount of subsequent inconvenience, this is not invariably the case, as I have known the formation of chalk-stones occur very shortly after the commencement of the disease, and, within a period of two or three years, increase to such an extent as entirely to cripple the patient. Such an occurrence, however, forms the exception, and not the rule, in the progress of gout, for, on the other hand, many cases have come before me in practice, in which the patients have suffered, more or less, for forty or fifty years, without perceptible inconvenience.

Acute gout, even in its first attack, and apparently with but slight local inflammation, will occasionally cause permanent stiffness, or complete anchylosis, and this may occur with very little accompanying enlarge-

ment, though attended with serious changes in the deep structures of the joint.

A recent case well exemplifies this fact:—J. P., a male patient, fifty-six years of age, by occupation a fishmonger, having no known hereditary predisposition to gout, has been accustomed to drink pretty freely of porter and gin, as much as four pints of the former, and half-a-pint of the latter daily, sometimes more. About five or six years since, when going upstairs with a heavy weight, his foot slipped from one stair to the next, but he did not consider that he had hurt himself; about two or three days after, the ball of the great toe became very painful, red, swollen, and hot, and the attack lasted from three weeks to a month, no treatment being adopted except rest in bed; since that period he has occasionally had pains in this joint, but has never been again laid up with it. Although there has been but one distinct attack, the joint is completely anchylosed. About eleven months ago he had pain and swelling of the right ankle, and also of some of the joints of the fingers, several of which were left partially anchylosed. The attack for which he came under my care, and which was apparently caused by an operation for hæmorrhoides, commenced about ten days previously, with pain in the right ankle and two of the fingers of the left hand; two days after the pain left the right and attacked the left ankle, and subsequently the knee on the same side. At the time he was first seen, there was considerable swelling of the first phalangeal joint

of the middle finger, and pain was occasioned on attempting to move it; the ankles were only slightly swollen, but tender on pressure. One of the phalangeal joints implicated during the last attack was found swollen and stiff, and appeared to be partially anchylosed.

Another instance has come under my notice, of a gentleman who, although free from all appearance of deposits, has complete rigidity of the ball of one great toe, the result of a few fits of acute gout; on the other hand, patients may have repeated attacks, and yet no very perceptible rigidity ensue, although we shall find the structures of the joint considerably affected.

Within the last two years, since the publication of the first edition of the present work, I have had the opportunity of examining the condition of the great toes in two instances of anchylosis, which will be found described and delineated in Chapter VII.

Before concluding this chapter, I cannot refrain from giving the passage from Sydenham,* although often before quoted by authors, in which he describes the gouty fit; the description is so graphic and vivid, the result of acute and severe personal suffering:—

"Towards the end of January or the beginning of February, suddenly and without any premonitory feelings, the disease breaks out. Its only forerunner

* From the translation of Sydenham's Works, by Dr. R. G. Latham.

is indigestion and crudity of the stomach, of which the patient labours some weeks before. His body feels swollen, heavy, and windy—symptoms which increase until the fit breaks out. This is preceded a few days by torpor and a feeling of flatus along the legs and thighs. Besides this, there is a spasmodic affection, whilst the day before the fit the appetite is unnaturally hearty. The victim goes to bed and sleeps in good health. About two o'clock in the morning he is awakened by a severe pain in the great toe; more rarely in the heel, ankle, or instep. This pain is like that of a dislocation, and yet the parts feel as if cold water were poured over them. Then follow chills and shivers, and a little fever. The pain, which was at first moderate, becomes more intense. With its intensity the chills and shivers increase. After a time this comes to its height, accommodating itself to the bones and ligaments of the tarsus and metatarsus. Now it is a violent stretching and tearing of the ligaments—now it is a gnawing pain, and now a pressure and tightening. So exquisite and lively meanwhile is the feeling of the part affected, that it cannot bear the weight of the bedclothes nor the jar of a person walking in the room. The night is passed in torture, sleeplessness, turning of the part affected, and perpetual change of posture! the tossing about of the body being as incessant as the pain of the tortured joint, being worse as the fit comes on. Hence the vain efforts, by change of posture, both in the body and the limb affected, to obtain an abatement of the pain. This

comes only towards the morning of the next day, such time being necessary for the moderate digestion of the peccant matter. The patient has a sudden and slight respite, which he falsely attributes to the last change of position. A gentle perspiration is succeeded by sleep. He wakes freer from pain and finds the part recently swollen. Up to this time, the only visible swelling has been that of the veins of the affected joint. Next day (perhaps for the next two or three days), if the generation of the gouty matter have been abundant, the part affected is painful, getting worse towards evening and better towards morning. A few days after, the other foot swells, and suffers the same pains. The pain in the foot second attacked regulates the state of the one first attacked. The more it is violent in the one, the more perfect is the abatement of suffering and the return of strength in the other. Nevertheless, it brings on the same affliction here as it had brought on in the other foot, and that the same in intensity and duration. Sometimes, during the first days of the disease, the peccant matter is so exuberant, that one foot is insufficient for its discharge. It then attacks both, and that with equal violence. Generally, however, it takes the feet in succession. After it has attacked each foot the fits become irregular, both as to the time of their accession and duration. One thing, however, is constant—the pain increases at night and remits in the morning. Now a series of lesser fits like these constitutes a true attack of gout—long or short, according to the age of the

patient. To suppose that an attack two or three months in length is all one fit is erroneous. It is rather a series of minor fits. Of these the latter is milder than the former, so that the peccant matter is discharged by degrees, and recovery follows. In strong constitutions, when the previous attacks have been few, a fortnight is the length of an attack. With age and impaired habits gout may last two months. With *very* advanced age, and in constitutions *very* much broken down by previous gout, the disease will hang on till the summer is far advanced. For the first fourteen days the urine is high-coloured, has a red sediment, and is loaded with gravel. Its amount is less than a third of what the patient drinks. During the same period the bowels are confined. Want of appetite, general chills towards evening, heaviness, and a troublesome feeling at the parts affected, attend the fit throughout. As the fit goes off, the foot itches intolerably, most between the toes; the cuticle scales off, and the feet desquamate, as if venomed. The disease being disposed of, the vigour and appetite of the patient return, and this in proportion to the violence of the last fits. In the same proportion the next fit either comes on or keeps off. Where one attack has been sharp, the next will take place that time next year—not earlier."

CHAPTER III.

CHRONIC GOUT:—NOT A CONSTANT SEQUEL TO THE ACUTE AFFECTION—DESCRIPTION OF—CONSTITUTIONAL SYMPTOMS—ALTERATIONS OF STRUCTURE PRODUCED BY CHRONIC GOUT—NATURE OF THE SO-CALLED CHALK-STONES OR TOPHACEOUS DEPOSITS—THEIR MICROSCOPIC AND CHEMICAL CHARACTERS—THEIR FREQUENT OCCURRENCE—SITUATION OF—UPON EARS—OFTEN USEFUL IN DIAGNOSIS—AROUND JOINTS—WITHIN BURSÆ—CAUSING MUCH DEFORMITY—ILLUSTRATIVE CASES—GOUTY ABSCESSES—MR. MOORE'S DESCRIPTION OF—CIRCUMSTANCES LEADING TO THE FORMATION OF EXTENSIVE CHALK-LIKE DEPOSITS—SYDENHAM'S DESCRIPTION OF CHRONIC GOUT.

THE boundary line between acute and chronic gout is completely arbitrary; nevertheless, when the disease has made much inroad upon the constitution, and its attacks have become frequent, the affection assumes a form to which the term Chronic Gout may properly be applied, and though it may not cause such excruciating suffering as the more rare and intense visitations of the acute disease, still, by its protracted duration, it is apt to induce a depraved state of the whole system, and by leading to distortion and rigidity of the joints, the formation of chalk-stones and other sequelæ, embitter the life of the sufferer to such an extent that, as Heberden forcibly remarks,—"That gout causes premature death, when all the comforts of life are destroyed, and the physical powers either insensibly

undermined or suddenly crushed by an attack of paralysis or apoplexy, should hardly be reckoned among the misfortunes attending the disease." It must not, however, be assumed that gout always leads to such terrible results, for, when the constitution has been originally good, when little or no hereditary predisposition exists, and no great depressing cause or improper treatment has subsequently induced a shattered condition of the system, instead of the attacks increasing in frequency, they may become more and more rare, and even after a lengthened period, little injury may have resulted from them. A gentleman, who died a few years since, under my care, at the advanced age of eighty-four, had suffered from gout for more than half a century, but the upper extremities had been always exempt: no chalk stones, stiffness, or deformities were visible; and during the latter part of his life the fits were slight, and at long intervals. Many other cases in which gout had lasted from thirty to forty years, without any appreciable amount of injury resulting, have come under my observation in practice.

In the other and less favourable class of cases, the disease gradually becomes more frequent and irregular in its visitations; instead of occurring annually, or half-yearly, only a month or two may elapse between the attacks, and as these are generally more prolonged than in acute gout, a fresh fit will frequently ensue before the subsidence of the preceding one, and thus the patient may be scarcely free, except during a few of the summer months. The joints are usually swollen

from effusions into the bursæ or capsules, and likewise stiffened; there may be no redness or increased heat, comparatively little pain, and an absence of febrile excitement, except perhaps a little at night, accompanying the increased pain which then generally occurs. Although there may be no fever, still other symptoms, which often precede and accompany attacks of acute gout, are apt to be present in an exaggerated degree, such as muscular and nervous pains (often regarded as rheumatic), cramps, dyspepsia in all its varieties, evinced by acidity, heartburn, pyrosis, flatulence, weight and pain after food, palpitation of the heart, constipation, deficient or depraved secretion of bile, lowness of spirits, and so forth, leading in time to great impairment of the general health, sallowness of the complexion, and emaciation. The urine, at first of a high colour and throwing down copious sediments of urates on cooling, now becomes pale, remains bright, is more copious, and, if deposits occur, it is only after a severe exacerbation; a trace of albumen is frequently present, especially when the joints are much inflamed and febrile disturbance exists.

Sometimes chronic gout is confined to one or two joints, sometimes numerous articulations are involved; occasionally it leaves the joints and attacks other and more important structures. When limited to a few joints the disease is likely to produce permanent local mischief, but when it assumes the erratic form, the serious effects described under Misplaced and Retrocedent Gout, are prone to occur.

Chronic gout seldom continues in one locality for any length of time without giving rise to serious and permanent change of structure, consisting either in the production of partial or complete anchylosis of the joints, or the formation of the so-called chalk-stones, either around the articulations, or in other parts of the body.

Before describing these modifications, it will be well to allude to the nature and composition of the chalk-like deposits, as their occurrence is completely pathognomonic of the disease, being never found in any other malady than genuine gout. They are called chalk-stones, and hence the variety of the disease in which they are seen is sometimes designated chalk-gout; other names have been occasionally applied to them—as tophi, a word derived from the Hebrew, and implying concretion. The term chalk-stone is, strictly speaking, erroneous; it was first used when the deposited matter was supposed to consist of chalk, but we now know that no such ingredient exists in its composition, and that when pure it may be devoid of lime in any form. Although the older physicians were entirely ignorant of the true nature of this chalk-like matter, their ideas as to its pathological relations were not so erroneous, as has been generally supposed; for the ancient writers, including Sydenham and all other authors belonging to the school of humoral pathology, considered the matter to be undigested gouty matter, thrown out around the joints, and afterwards becoming hardened.

The consistence of these deposits varies exceedingly; sometimes they are soft, at other times as hard as chalk itself; in order to demonstrate their true character, we will examine them carefully in both conditions.

A little white spot is often observed upon the helix of the ears of patients suffering from chronic gout, and if such has been recently formed, it gives rise, when punctured with the point of a lancet, to the exit of a semifluid cream-like exudation. This matter, when covered with a film of glass, and placed under the microscope, exhibits the appearance shown in Plate 5, fig. 3, and consists of a clear fluid containing a great number of acicular crystals, exceedingly small, and requiring considerable magnifying power, and good definition to show them distinctly; with these crystals a few blood discs are frequently mixed, arising from the slight injury to the skin. If a little of the white exudation be heated with a few drops of dilute nitric acid upon a porcelain dish, and when almost dry exposed to the vapour of ammonia, a beautiful purple

Fig. 7.*

* Fig. 7. The appearance presented by a drop of the cream-like fluid obtained by puncturing a recently formed urate of soda deposit. That in the drawing was obtained from the knuckle of a patient whose case is described in the present chapter. Linear magnifying power 220, polarised light.

colour is produced from the formation of murexide, or purpurate of ammonia; if, on the other hand, it be dried and incinerated, a little ash is left, alkaline, and exhibiting all the reactions of soda. Under polarised light, the appearance presented resembles that seen in fig. 7. The white matter is soluble to some extent in hot water, and its solution on cooling or evaporation deposits needle-like crystals of urate of soda, usually arranged in balls or tufts (Plate 5, fig. 4).

If a concretion in a semi-solid condition be examined, the same appearance is exhibited, except that the crystals are more aggregated together in masses sometimes difficult to separate from each other, but this can be effected by putting a drop of water upon the slide, and then using a little pressure with the thin upper glass.

These white deposits are thus shown to consist essentially, often entirely, of urate of soda, but, when embedded and hardened in any tissue, animal and earthy matters may become intimately united with them, these can be separated by treating the mass with hot water, and dissolving out the urate of soda. A small portion of the uric acid is now and then found in combination with some potash or lime existing in the tissues, in the form of urates of these bases, but the amount of such salts is generally insignificant.

It is probable that when first thrown out the matter forming the deposits is in the form of a limpid fluid, but, being rich in urate of soda, rapidly assumes a milky appearance from the crystallisation of that salt;

the watery portion is slowly absorbed, and the concretions gradually harden until they acquire a firm consistence. Subsequent to the examination by Dr. Wollaston, in 1797, there have been several analyses of these concretions taken from different parts of the body; one, by Marchand, from the femur, was found to consist of:—

Urate of soda	34·20
Urate of lime	2·12
Carbonate of ammonia	7·86
Chloride of sodium	14·12
Animal matter	32·53
Water	6·80
Loss	2·37
	100·00

Another analysis, by Lehmann, of a concretion from the metacarpus of a young man who had suffered from gout, was found to contain a great number of four-sided prisms of urate of soda, and when dried yielded the following results:—

Urate of soda	52·12
Urate of lime	1·25
Chloride of sodium	9·84
Phosphate of lime	4·32
Cellular tissue	28·49
Water, loss, &c.	3·98
	100·00

There are other analyses, as those of Laugier, Wurzer, and L'Heretier, which closely agree with

each other and prove that these deposits are rich in uric acid and soda, but contain other substances in small quantities, as phosphate of lime, chloride of sodium, and organic matter. L'Heretier found a large per-centage of phosphate of lime, but gave no details concerning the situation of the concretion.

As before observed, there can be no doubt but that the essential component in gouty deposits is urate of soda, which, in every one of the numerous examinations I have made, was always found to exhibit a crystalline form; the large amount of phosphate of lime, occasionally met with, is probably derived, not only from the tissue in which the deposit has taken place, but likewise from secondary deposition, the result of ordinary inflammation around the urate of soda, acting as a foreign body, and which therefore, as in the case of cretaceous tubercles in the lungs and elsewhere, must be regarded, not as related to the disease as gout, but as the result of common inflammation only.

Having given a minute account of the intimate structure and composition of gouty deposits, we will next describe the principal alterations which they produce in and around the joints and elsewhere.

Partial or complete anchylosis, which is of rare occurrence in acute gout, frequently supervenes in its chronic forms; sometimes there is no bulging or enlargement of the joint, or the appearance of any external deposit; but it is often accompanied with a moderate amount of swelling, and when this occurs in

the small joints of the hand, an appearance represented in fig. 8, is produced.

In the hand from which the drawing was made, not only was there sufficient deposit to cause bulging, but little white points could be seen here and there, especially about the palmar ends of the fingers, showing

Fig. 8.*

the close approach of the urate of soda to the surface. When there is no enlargement, a very peculiar and angular form of distortion of some of the phalangeal joints often ensues; so characteristic, indeed, as to afford, to the practised eye, almost complete evidence of the nature of the disease producing it. This form

* Fig. 8. A drawing from a wax model, in the anatomical museum of University College, of the hand of a patient suffering from chronic gout of many years' duration, and represents a condition not unfrequently met with. A few white points are seen where the chalk-like matter has approached the surface.

will be again referred to when the varieties of the so-called Rheumatic Gout are treated of.

Comparatively few gouty patients become the subjects of visible chalk-stones, at least to the extent of producing deformity, but I am convinced that their occurrence in a slight degree is by no means so rare as has been hitherto assumed. Sir C. Scudamore stated that in five hundred cases of gout he only found them forty-five times, or in less than ten per cent. From my own experience I consider these numbers far below the real proportion, feeling confident that their existence is frequently overlooked, from their being deposited in parts of the body scarcely to be expected. Small concretions are mentioned by some writers as having been seen upon the cartilages of the ears, but no particular notice is taken of the fact. Within the last few years I have specially investigated this point, and find that, instead of such deposits being occasionally present on the ear, they are more frequently found there than in any other situation;* and that when they are visible upon any other part, they are usually, but not invariably, seen on the ears also.

In thirty-seven gouty patients who were examined some years since to ascertain the presence or absence of concretions of urate of soda upon the surface, or in such situations as to be undoubtedly recognised, it was noted, that they were present in seventeen cases, absent in twenty; in the above seventeen, they occurred in the ears alone in seven cases, in the ears

* Medico-Chirurgical Transactions, volume xxxvii., 1854.

and around the joints in nine, and in one case only could they be recognised in other parts of the body, without being present in the ears likewise.

Within the last eight years I have sought for the occurrence of these spots on the ears in a large number of cases, and from such experience am inclined to think that in females they are seldom seen in this locality; the probable cause of this exemption will be dwelt on in a subsequent chapter. Sometimes the spots are single, sometimes numerous; they are often smaller than a pin's head, but now and then equal to a split pea, or even larger. They have the appearance of little pearls, and are generally situated about the fold of the helix: sometimes they are hard and gritty, but more frequently soft, and when punctured give exit to a milky fluid. Further examination shows that when hardened they become firmly attached to the cartilage of the ear, and enlarged blood-vessels are often seen in their neighbourhood, and even extending some distance from them.

In Plate 1, fig. 1, an ear is represented having but one of these points; it was the only evidence of chalk deposit which could be discovered throughout the body of this patient.

The following is an abstract from the history of his case.

1854.—J. E., aged forty-three, a gardener, with no hereditary predisposition to gout; has lived well, drank freely of porter, and now and then taken spirits. The first attack of gout came on when he was thirty-one

years of age, and was confined to the ball of the great toe, lasting about a week; the second attack was likewise limited to the same joint, and occurred about a year afterwards; the fits subsequently returned more frequently, and the ankles, knees, and hands became involved. About ten weeks before he was under my care he felt chilly and feverish, with pains in the head and oppression of the chest; one of his wrists inflamed, and the head was relieved; about a fortnight after his recovery from this attack, which lasted a month, he had an affection of one ankle and great toe. On my seeing him, the toe was still tender, pitting a little on pressure, with signs of commencing desquamation of the cuticle. There were no chalk-stones observed around the joints, and no deformity or stiffness of any of the articulations which had been previously implicated; but at the upper part of the helix of the right ear a pearly white spot was seen about the size of a small millet seed.

Plate 1, fig. 2, also represents the ear of a gouty man, in whom the disease was much further advanced, and several other concretions were seen on different parts of his body.

The following is a very condensed history of this patient's case—

1855.—J. D. M., a man about fifty-eight years of age, not inheriting gout, has been engaged for many years in a cook-shop, and has lived well, taking much meat, and drinking freely of porter and gin. For the last twenty-five years he has suffered from gout, at

first in one or other great toe, and at intervals of a year or two, but after a time the attacks increased in frequency, and many joints were affected. For more than twelve years he has had rigidity and distortion of some of his joints, especially of the hands, and chalk-stones have formed, some of which have been discharged by ulceration. Upon both ears many little white points are seen, and the blood-vessels leading to them are distended; he had frequently observed that before a fit the ears became painful. During the time this patient has been under my observation, now many years, the appearance of the ears has greatly changed, a circumstance arising from the detachment of some of the old nodules, and the formation of new ones; when recent they are liquid, exhibit a beautiful crystalline appearance under the microscope, and yield murexide with nitric acid and ammonia. The blood of this patient has been examined two or three times, and found loaded with urate of soda; the urine is slightly albuminous during a severe attack, but not in the intervals: its analysis is given in a subsequent chapter.

I have seen several patients with ears much more extensively affected than the above, both as regards the number and size of the deposits. One gouty gentleman at Vichy, who was undergoing a course of the waters, exhibited a row of from ten to twelve beads, like large pearls, arranged along the edge of the helix of one ear.

The presence of deposits in the ears deserves atten-

tion, as it may prove of considerable service in the diagnosis of doubtful cases; I would observe that when I have failed to find them in the ears of men when present elsewhere in the body, it has been in individuals in whom these organs were unusually warm. The deposits are probably formed during an attack of gout, but occasionally they appear shortly afterwards; in one case, of which I have notes, the ears were carefully examined without result when the patient left the hospital, but within ten days, on a re-examination, a deposit was found; perhaps some fluid was effused during the fit, but being at first transparent could not be easily distinguished. Patients with these auricular deposits not uncommonly feel pricking and pain in their ears at the commencement of an acute gouty attack, as in the case above related.

In only one instance, and that within the last nine months, have I met with a patient in whom the ears appear to have been first attacked with gout, and exhibited deposits of urate of soda before any articular disease had developed itself. The case is interesting in many points, and I will therefore give a short abstract of it.

1861, July.—J. T., a man aged 58, came under my care in the hospital; he is married and has had ten children; was a relieving officer for twenty-one years, which appointment he resigned three years since on account of ill-health. He inherits gout from his father, and one of his sisters is likewise subject to it. Has been accustomed to take malt liquors, about a quart

each day, but states that he has always been temperate, but very irregular as to his meals; when about seven years of age is reported to have had rheumatic fever. About twenty years since he experienced his first attack of gout, which he describes as commencing in the right hand, but the next day the ball of the right great toe became affected, and soon afterwards the left foot and both knees; the disease travelled from feet to knees, and back again from knees to feet; the fit lasted about eight weeks. Two years afterwards he had a second attack, and then at intervals of from one to three years. In the pursuit of his occupation he was several times thrown out of his gig, and after each fall gout invariably occurred.

About ten years since, deposits commenced forming in the hands and feet, but the patient affirms that even as long ago as twenty-five years, that is, five years prior to any distinct attack of articular gout, he had noticed nodules on his ears.

When admitted into the hospital he was suffering severely from extensive deposits, which were seen in both hands, many of the finger joints being greatly distorted and nodulated; a large lump was felt in the bursa of left elbow. The hips, knees, and ankles apparently uninjured, but the feet much deformed, the right great toe joint considerably enlarged, and a mass of deposited matters the size of an egg extended over the metatarsal bones: there was a deposit likewise on the heels. The left foot was much swollen from urate deposits on each dorsal surface, and from

many points pus was seen exuding mixed with chalky matter; several white points were seen on the left ear, and one on the right ear. The urine gave on analysis scarcely a trace of uric acid, sp. gr. 1010, with a small amount of albumen.

Gouty concretions are commonly situated upon the hands and feet, but the upper extremities are more usually affected than the lower. A short time since, in 1858, a gentleman was under my care whose case well illustrates the early development of these deposits. He was about 63 years of age, looked healthy, and in good plight; had suffered from gouty attacks during the last twenty-five years; at first they were confined to the great toes, they then gradually affected the feet, ankles, and knees, but latterly the hands were also involved. He had an attack in the spring of that year, which was more lengthened than usual, and he afterwards observed that some of the articulations of the fingers remained slightly crippled; in this condition he first applied to me. The last phalangeal joints of two or three fingers were stiffened, partially anchylosed, and a little swollen, but on the dorsal surface of the second phalangeal joints of three fingers small rounded protuberances were observed, the skin over them being red; these bulgings appeared soft, as if containing a thick fluid, but not the slightest indication of white matter could be seen through the skin; they might have been either gouty concretions in their early stage of formation, or some other form of swelling; from a simple inspection I could form no

opinion as to their true nature; but the history convinced me that they arose from a deposit of urate of soda. Upon puncturing one of the little swellings, full light was thrown upon the case, as a thick white fluid immediately exuded, a drop of which placed under the microscope, with the use of polarised light, gave the appearance represented in fig. 7 (page 57), which was drawn from the slide in which some was preserved; the crystals were proved by analysis to consist of urate of soda.

These swellings, as they increase in size and become more solid, approach the surface; the skin becomes thinner, and the peculiar white appearance is then seen, which at once reveals their character as observed in the great toe (Plate 1, fig. 3), and in the ears before referred to. The history of the man from whose toe the drawing was made is shortly this:—

1854.—T. C., aged 57. A house painter for forty-three years. Has lived well and drank freely. His general health had been good till within the last twelve years, when he fell from a scaffold and shortly afterwards had lead colic. Gout then commenced in the great toe, and the attacks have of late years much increased, both in severity and frequency; on the ears, and around numerous joints of the body besides the delineated toe, many white urate deposits are visible, some of considerable size.

Joints around which chalk-stones have formed, become distorted in proportion to their number and extent, until at last the most fearful crippling occa-

sionally ensues; such, for example, as is represented in the hand in Plate 2.

This unfortunate patient, J. E., the time that the drawing was made of his arm and hand, was sixty-seven years of age; since his boyhood he had lived as servant in different families. At the age of thirty-six he had his first attack of gout in the great toe, and for many years the fits returned at short intervals: when about the age of fifty-three, tumours formed on the fingers and elbows, and subsequently about the joints of the feet, these swellings gradually increased in size, and after a while a fluid of the consistence and colour of cream was discharged from some of them. The tumours on the hands and elbows were considerably larger than those on the feet and knees; the movements of the elbow-joint were not much interfered with, but those of the hands greatly impeded. The patient's mother, grandmother, and brother, were affected with gout, but in a less degree. I have in my possession a chalk-stone taken from this man, which in a recent state weighed more than two ounces avoirdupois.

These exaggerated forms are not very commonly met with, although within the last few years I have seen many cases in which the hands were almost as much disfigured.

The various bursæ mucosæ are very liable to become inflamed during an attack of gout, and after the acute inflammatory action has passed off, may remain distended; this distension arises from a fluid having

been secreted in their cavities, a fluid which often gives rise to a deposition of solid matter, and hence results the formation of permanent chalk-stones. The bursa over the olecranon process of the elbow-joint is peculiarly prone to be thus distended, and in many cases we find its walls thickened and a little hard nodule is felt in the interior; sometimes, from repeated attacks, it becomes enormously distended, as is well shown in Plate 2. When no solid matter can be felt through the walls of these enlarged bursæ, they will occasionally, if punctured with a fine instrument, give rise to a fluid exudation, having the crystalline characters already described. The following case, which recently occurred in my practice, well illustrates this fact:—

1858.—W. F., a man aged sixty-one, has had gout for fourteen years. The first, as also several of the subsequent attacks, were confined to the ball of the great toe of right foot, the left great toe then became affected, and afterwards the elbows. No deposits of chalky matter were anywhere visible, but the bursa over left olecranon process was enlarged and prominent; the walls were thickened, and felt somewhat elastic, and the skin red; the patient had suffered very recently from an acute attack in one of the great toes. Feeling somewhat doubtful as to the character of the fluid within the sac, it was carefully punctured, and nearly half a drachm of a white matter exuded, which exhibited the characteristic crystalline appearance we have so often referred to,

due to the presence of innumerable prisms of urate of soda.

The bursa about the knee-joint is also liable to distension, and permanent enlargement may result from the deposition of gouty matter. I have now under my care (October, 1858) a patient who exhibits this deformity, and likewise a remarkable distortion of one finger from a like cause, which is represented in fig. 9 (page 73).

The history of the case and his present condition is as follows:—

J. B., a man aged forty-three, by trade a plumber, having no known hereditary predisposition to gout; temperate in his habits, but accustomed to take about two pints of porter a day; has suffered severely from gout for twelve or fourteen years, chiefly in spring and autumn; the first attack, which affected the great toe, occurred as far back as twenty years ago; after this he had a respite of some duration. About ten years since, the disease made its appearance in a more general form, many other joints, besides the great toe, being implicated; from this time the disorder became frequent in its visitations, and serious in its characteristics.

About five years ago, he noticed enlargement of the first phalangeal joint of the fourth finger of the left hand, apparently induced by running a piece of glass into it, but subsequently deposits appeared in many other situations. When the patient came under my care the following notes of his condition were taken: —a distinct blue line is seen on the free margin

of the gums, which, as well as the lips and surface, are somewhat anæmiated; he has never had lead

Fig. 9.*

colic. Upon the helix of the right ear two small white spots are observed and deposits can be distinctly felt in the bursa over the left elbow; both hands are much deformed, many of the phalangeal joints are anchylosed, and here and there the deposits approach so near the surface as to resemble white patches. The first phalangeal joint of the fourth finger of the right hand is most deformed, and swollen almost to the size of a small hen's egg, the long diameter of the tumour

* Fig. 9. A drawing of the hand of a patient in University College Hospital, in which the first phalangeal joint of the fourth finger of right hand is shown extremely enlarged from the deposition of urate of soda around it.

being transverse, and overlapping the fingers on each side, as shown in the engraving, fig. 9. The swelling is red, tense and shining, the blood-vessels distended, giving a sensation to the touch of being composed partly of solid, partly of semi-fluid matter; it has been increasing for many years, and doubtless consists of urate of soda of different degrees of consistency. Both ankles and the right foot are enlarged, but not œdematous; on several of the toes little white points are seen, from which chalky matter has formerly exuded; the bursa over the patella of the left knee is much enlarged and bulging, with several white spots where the deposit has approached the surface, and from which some has occasionally been discharged. The urine is pale in colour and rather abundant, its average specific gravity 1010, and during an attack of acute gout, slightly albuminous, exhibiting both granular and waxy tubular casts.

Not uncommonly, especially among workmen who are accustomed to use their hands in grasping tools, white deposits are seen on the palmar surface of the ends of some of the fingers, on account of the matter which was originally deep-seated becoming more superficial from constant friction, and I have recently observed the same produced in the right hands in gentlemen who had been in the habit of writing much.

Sometimes small nodules of urate of soda are found upon the eyelids, and now and then in the integuments of the face; Dr. H. Barker has seen one on the side

of the nose, the size of a horse-bean; and in one instance I observed a true gouty deposit as large as a split-pea, apparently attached to the fibrous structure of the corpus cavernosum of the penis. With regard to the white-looking deposits which often occur about the eyelids and the integuments of the face, I may remark that some care is necessary before deciding upon their nature, as they are seen in subjects who have never had gout, and also in gouty patients, and still may not be connected with the disease, merely consisting of epidermic scales mixed with fatty matter and cholesterine. I have recently examined two white deposits from the same individual, a martyr to gout; one taken from the helix of the ear, the other from the under eyelid; that from the ear was crystalline and consisted of urate of soda; that from the eyelid was simply sebaceous.

Since the publication of the first edition of the present work, Dr. Routh kindly sent for my inspection a young woman having a nodule upon the left ear, about the size of a small bean; it had all the outward appearances of a urate deposit, was somewhat hard, very white and opaque, but when punctured the contained matter was found to consist of epidermic scales and fat, and to yield no trace of uric acid. The patient, about twenty years of age, was not descended from gouty parents, and had never suffered from any articular disease.

After patients have suffered from gouty concretions for a long time, it is not uncommon to find that the

skin over them becomes thin, and fragments of the chalk-like matter are thrown off occasioning little annoyance; this often occurs in the fingers, toes, and heel, sometimes over the head of the tibia; in the ears it is of very frequent occurrence. But on the other hand these deposits may act as foreign substances, and set up considerable inflammatory action, accompanied with suppuration, and by this means ulceration is induced, which often proves difficult to heal; when such is the case, the discharged matter consists of small masses of urate of soda mixed with pus globules (Plate 6, fig. 3, and fig. 5, *b*). My own experience would lead me to believe that the condition of the patient's general health has considerable influence in such cases in causing inflammation and suppuration around the deposits, the lower the vitality the greater tendency to take on inflammatory action.

A very interesting and valuable paper on gouty concretions is contained in the first volume of the Medico-Chirurgical Transactions, 1809, by Mr. James Moore, Surgeon to the Second Regiment of Life Guards. In this communication the mode of formation and progress of these tumours is so graphically described that I have been induced to transcribe a portion. After a few preliminary remarks as to the nature of chalk-stones, he goes on to state:—"This effusion (meaning the milky fluid containing the urate of soda) occurs not only during fits of gout, but likewise in the intervals; and as the extremities, particularly the hands and feet, are the principal seat of gout,

it is there the greatest accumulation of chalk takes place. Though this process is usually preceded and accompanied by inflammation, the chalk is never inclosed in a cyst, like pus in an abscess. It lies usually in the cellular membrane, in the bursæ mucosæ, or in the cavities of the joints. I have even seen it thrown out between the cutis and the cuticle. But, as the gouty inflammation is of the erythematous kind, there is no extravasation of coagulable lymph, and no new-formed covering surrounding the chalk. This point is of the first importance, and explains many of the peculiarities of gout, which is generally considered as a phlegmon. But the absence of coagulable lymph in the inflamed parts I consider as full evidence of the inflammation being erythematous.

"The chalky liquid when first secreted gives to the finger the feeling of fluctuation, and cannot be distinguished from the ordinary serous effusion of gout. But unfortunately the absorbents cannot suck up the chalky particles. The consistence of the liquid, therefore, becomes thicker and thicker, till at last nothing remains but a hard mass. When even a considerable effusion of this kind occurs, the quantity of chalk which ultimately remains is comparatively small, as by far the greater quantity is merely serum. It therefore usually requires repeated effusions to form any great mass of chalk, and the consistency depends upon its age, and the activity of the absorbents. The quantity at last accumulated by repeated paroxysms

is in some instances immense, which augments very seriously the sufferings of the gouty. The distress, however, is not owing to any irritating quality in the chalk, but to its obstructing the motion of the tendons and joints, occasioning often complete anchylosis, and pressing and distending the surrounding parts by its bulk. It acts, therefore, by mechanically embarrassing the machine of the body, and not upon the living principle; for it will often remain for years in parts highly sensible without exciting the slightest pain or inflammation. Although these concretions are of so mild a nature, they often are the cause of extensive mischief, bursting externally, occasioning ulcers very difficult to heal. When a violent fit of the gout attacks a chalky tumour, the appearance is frequently very alarming, the new paroxysm being accompanied with a fresh serous and chalky effusion, which added to the old deposit of chalk, occasions a prodigious swelling; the cutis when distended to the utmost opens, yet sometimes the cuticle remains entire. The chalky or serous liquid may then be seen through the semi-transparent epidermis. The surrounding integuments appear of a deep red, or of a purple hue, threatening mortification; while the pain is excruciating.

"At length the cuticle gives way, a discharge of serum and chalk takes place, and a remission of all the symptoms usually follows. During the whole of this alarming process suppuration never occurs; but soon after the opening has taken place suppuration

commences, and pus and chalk are then discharged from the ulcer. There are several unexpected occurrences in the progress of such ulcerations. When an opening is formed, the whole of the chalk never escapes, and its complete evacuation is often a very tedious process; this is owing to its being diffused through the cellular membrane, as in the cells of a sponge. One cell must sometimes give way after another, and small portions of chalk are successively thrown out, so that months and even years pass away before the whole is discharged. It also frequently happens that the orifice contracts and closes over, leaving portions of chalk underneath. This kind of cicatrix sometimes stands its ground, but more commonly breaks out again and again to discharge chalk. Even openings into joints, which are so dangerous when occasioned by other extraneous bodies, are often attended with no serious symptoms when the joint is filled with chalk. On such an accident happening, a surgeon unacquainted with these peculiarities might be tempted to propose large openings or even amputation, as the only resource for hindering extensive inflammation and carious bones. But if he treats the disease mildly, he will find that no such severe plans are requisite, for the parts will probably fall into a very tranquil or indolent state; a sore will continue for a certain period, discharging pus and occasionally a bit of chalk, till at last the orifice will close up. Independent of the openings formed by a fit of the gout, the skin, stretched over a mass of chalk, is

sometimes thinned, absorbed, and pierced by mere pressure. At other times this is effected by common inflammation and suppuration. When openings take place in these milder ways, a less quantity of chalk is usually evacuated: but this depends entirely upon the degree of inflammation. When the suppuration is great, it naturally detaches and washes out a greater quantity of chalk.

"The last peculiarity is the rarest, namely, that a dry hard piece of chalk shall pierce the skin, and remain like an excrescence, without exciting either inflammation or suppuration."

The point upon which I should feel disposed to differ most from this writer, is with regard to the non-occurrence of suppuration prior to the opening of the skin; as I have seen many abscesses formed around gouty nodules, which have at once given exits to a large amount of pus, as well as urate of soda, on being punctured; this has occurred in patients in a weak state of health.

It not uncommonly happens, that when patients are suffering from gouty abscesses, which are keeping up a constant discharge of matter, they enjoy a comparative immunity from other symptoms, and I have known several instances in which the healing of these abscesses was followed by a sharp attack of gout in some other part of the body, showing that the ulcers had acted as a kind of safety-valve.

Some patients appear remarkably prone to the formation of gouty concretions, while others, even after

a considerable number of fits, remain entirely free; this remark, it must be remembered, only applies to deposits of urate of soda around the articulations, for all, as I shall presently prove, have alterations within the joints. Although it is much more common to observe the deformities produced by this disorder among men, females are by no means exempt, and I have had under my care several women exhibiting this form of the affection in a very marked degree; in one lady both the upper and lower extremities were stiffened and distorted by the bulging of nearly all the smaller joints, and the patient, who was about forty-three years of age, had become completely crippled within three years of the first attack of the disease. In another case the deformity was much less marked, although the hands were nodulated and rendered almost useless. The late Mr. Samuel Cooper related a similar instance he had seen in a lady not more than thirty years of age, at the Fleet prison, who was in such a state from deposits around the joints, that her limbs were of little or no use to her, and when her knees were bent and extended, a rattling noise was produced like that which would arise from shaking a bag of marbles.

Within the last few months I have had under my charge in the hospital a female in which the deformity arising from gout is shown in a very extreme degree, and as her case is instructive, and in many points peculiar, I will give a short abstract from my case-book:—

M. A. F., aged forty-nine years, married, has had several miscarriages, but no family; knows of no hereditary predisposition to gout, but was always delicate from the age of nine years until she was twenty; she lived with her aunt, in a public-house, as barmaid. She was advised to take a little port wine on account of her weakness, but she soon increased the amount till she drank a considerable quantity each day. At the age of twenty-nine years she experienced her first fit of gout, commencing in the right great toe, but within a few days implicating the left thumb; the attack, however, was not severe, and she was soon able to resume her occupation. The attacks returned at intervals, with moderate severity, until about eight years since, when she was so extremely ill as to seek admission into the hospital, and came under my care. At this time she not only suffered from joint affection but also severe epistaxis; concretions of urate of soda had already formed around many of the joints of the fingers and toes, and the urine was very pale and of low specific gravity. After remaining in the hospital about two months she left much relieved, and was lost sight of until her re-admission in June, 1861; during this interval, a period of eight years, she had suffered from repeated fits of gout, and gradually increasing deformity from the rapid deposition of chalk-stones. The state of her joints was now frightful, the hands completely crippled, the fourth finger only being moveable, or in the least approaching the natural shape. A representation of the left hand is seen in fig. 10.

The left elbow was swollen from a deposit over the olecranon process, the knees enlarged and deformed,

Fig. 10.*

and both feet greatly distorted; on the metatarsal bone of the right great toe was a large mass of chalky deposit, about $2\frac{3}{4}$ inches in length, and $1\frac{3}{4}$ inches in breadth; the great toe was also much swollen from the same cause. These appearances are seen in the annexed woodcut, fig. 11.

Scarcely a trace of uric acid could be discovered in this patient's urine on analysis, and the daily excretion of urea was very deficient. Besides the deformity from the excessive deposits of urate of soda, the chief features exhibited by this patient were extreme pallor of complexion from depraved nutrition and impure blood; the frequent occurrence of epistaxis, chronic

* Fig. 10. A drawing of the left hand of a woman in University College Hospital, suffering from extreme chalk-stones in nearly every limb.

vomiting, and vertigo from the renal deficiency; she also occasionally had attacks of dysuria, and some years since had passed a small urinary calculus.

Fig. 11.*

An excessive formation of chalk-stones is, I believe, invariably connected with deficient eliminating power of the kidneys, as will be shown in the chapter devoted to the consideration of the urine in gout, and in many cases this can be more or less distinctly traced to the influence of depressing causes, as an impoverished diet, arising from sudden reduction of circumstances, a severe shock to the nervous system, debility from the supervention of other diseases, and so forth.

Several cases, apparently arising from some of the above-mentioned causes, have been under my care

* Fig. 11. A drawing of the right foot of the same woman from whom the delineation of the hand (fig. 10) was obtained.

during the last few years; the following is an example selected from them:—

1851.—W. B., a man aged fifty-one, with no hereditary predisposition to gout, when about sixteen years of age went to service as steward's-room boy, afterwards became postilion, and was accustomed to drink as stablemen usually do; he was often out on the box all night, exposed to wet and cold. In 1826 he went to the Mediterranean, and travelled through France, Italy, and Switzerland, in the capacity of gentleman's coachman, and partook freely of the new wines of the countries, and also of brandy. He returned to England in 1830, quite well, but had suffered from some brain affection when abroad from exposure to the sun. Shortly after this he experienced fits in the August of each year, which were considered to be epileptic, and these obliged him to discontinue service, and to live very sparingly. The fits continued until 1845, when they terminated upon the occurrence of gout in the ball of the right great toe. The first paroxysm lasted about ten days, and he had no return for a year, when both feet were affected; the attacks after this rapidly increased in frequency and severity, and the hands, elbows, and knees became implicated. As early as after the first seizure in the upper extremities, he noticed some white spots in the tip of the right little finger, and soon afterwards numerous deposits took place around almost all the smaller joints of the hands, and many of the feet, and nodules were also seen on the ears.

At length he became completely crippled and deformed, some of the deposits growing to a large size, and causing ulceration of the skin, and abscesses in different parts. The urine was very pale, with a slight trace of albumen, and scarcely any uric acid could be separated from it.

On the other hand it frequently happens that no depressing cause can be shown to have acted in the production of these deposits, and now and then they occur in patients whose constitutions are in other respects exceedingly good, and in whom the force and the duration of the disease must alone be looked for as cause. A gentleman occasionally consults me, now about eighty-nine years of age, having both hands and feet extensively enlarged from deposits, many of which have formed abscesses constantly discharging urate of soda.

Another case in which the gouty enlargements were excessive, the hands of the patient being almost as much deformed as that represented in Plate 2, was under my care about five years since.

1857.—The gentleman was sixty-one years of age, and had no hereditary predisposition to gout. In early life he lived freely, partaking chiefly of malt liquors and spirits. Has had a very large family, all of whom are healthy. The first fit of gout came on about thirty years since, in the ball of the left great toe; there was only an interval of half a year between the first and second visitation, but several years elapsed before the knees were attacked, and still a longer

period before any of the joints of the upper extremities became implicated. For the last ten years he has noticed chalk stones, and is now extremely deformed and crippled by them; all the joints of the hands are completely studded, as likewise are both elbows. The feet are much distorted; large masses are seen on the inner side of the left tarsus, from which fragments of white matter have been discharged; and there is much thickening around each heel. Both ears are studded, and some of the nodules are of considerable size; deposits are also seen near the inner canthus of each eye.

He complains of but few uncomfortable symptoms, other than acidity and heartburn, but north winds, or the least indulgence in wine or ale, are very apt to induce fresh inflammation about some of the crippled joints.

He remembers that his urine formerly threw down a red sediment, but of late years (the last six or seven) it has become much paler and completely free from deposit; at present it is of low specific gravity, containing a distinct trace of albumen, but yielding scarcely any uric acid.

Chalk-stones may be occasionally traced to injuries which, however, act simply in localising them; I have seen them on the back of the hand, the result of blows, and it is probable that the collections of urate of soda in the bursæ of the elbow so often observed arise from the pressure to which they are subjected.

Sydenham's account of the progress of chronic gout,

and of the sufferings and deformities produced by it, is equally correct and graphic with his delineation of the acute fit, and I cannot, in concluding this chapter, do otherwise than bring it before my readers in his own emphatic words :—

"When either undue treatment or the prolonged delay of the disease has converted the whole body into a focus for the peccant matter, and when nature is incompetent to its elimination, its course is different.

"The true seat of the disease is the foot, so much so, that when it appears elsewhere its character is changed, or else the constitution is weak. Then, however, it attacks the hands, wrists, elbows, knees, and other parts, the pains being as the pains of the feet. Sometimes it distorts the fingers, then they look like a bunch of parsnips, and become stiffened and immoveable. This is from the deposit of chalk-stone concretions about the ligaments of the knuckles. The effect of these is to destroy the skin and cuticle. Then you have chalk-stones like crabs' eyes exposed to view, and you may turn them out with a needle. Sometimes the morbific matter fixes on the elbows, and raises a whitish tumour, almost as large as an egg ; which gradually grows red and inflamed. Sometimes the thigh feels as if a weight were attached to it, without, however, any notable pain. It descends, however, to the knee, and then the pain is intense. It checks all motion, nails the patient down to his bed, and will hardly allow him to change his posture

a hair's-breadth. Whenever, on account of the restlessness so usual in the disease, or from any urgent necessity, the patient has to be moved, the greatest caution is necessary. The least contrary movement causes pain, which is tolerable only in proportion as it is momentary. This movement is one of the great troubles in gout; since with perfect quiet, the agony is just tolerable.

"Up to a certain time, the gout comes on towards the end of winter, lasts for two or three months, and retires regularly. Afterwards, however, it lasts throughout the whole year, except only the hottest months of the summer. Furthermore the longer the attack, in general, the longer is each individual fit. Instead of a day or two, they last a fortnight. Instead of the feet, they attack any joint indifferently. Lastly, on the first or second day after, the patient, besides the pain, has loss of appetite and general discomfort."

CHAPTER IV.

BLOOD IN GOUT:—ALTERED CONDITION OF THE BLOOD IN GOUT OFTEN ASSUMED BY THE OLDER WRITERS, NOT PROVED UNTIL VERY RECENTLY—COMPOSITION OF THE BLOOD IN HEALTH—ITS ALTERATION IN GOUT—GLOBULES—FIBRIN—ALBUMEN—DISCOVERY OF URATE OF SODA IN THE BLOOD—MODE OF SEPARATING URIC ACID AND URATE OF SODA FROM IT—CLINICAL METHOD FOR DETERMINING THE PRESENCE OF URIC ACID IN THE BLOOD—DETAILS AND PRECAUTIONS—DELICACY OF THE TEST—READY DECOMPOSITION OF URIC ACID IN THE BLOOD—PROBABLE CHANGES WHICH ENSUE—TABLE CONTAINING A SHORT SUMMARY OF CASES OF GOUT IN WHICH URIC ACID WAS PROVED TO EXIST IN THE BLOOD—DISCOVERY OF URIC ACID IN FLUIDS ARTIFICIALLY EFFUSED—USE IN DIAGNOSIS—SMALL AMOUNT OF UREA IN THE BLOOD IN GOUT, ALSO OF OXALIC ACID—TRACES OF URIC ACID AND UREA IN HEALTHY BLOOD—PERSPIRATION IN GOUT—OXALIC ACID FOUND IN THIS SECRETION.

In vain shall we seek among ancient writers, or even those of modern date, for satisfactory information respecting the alterations of the blood in gout, for until recently all that had been advanced, though embodying much truth, was purely speculative, and failed to convince the minds of many pathologists who endeavoured to explain the phenomena of the disease by other than the hypothesis of the presence of a morbific matter.

In this chapter it will be my aim to give an account of the present state of our knowledge on this subject,

of the highest importance for the right understanding of the pathology of gout, and for the clear explanation of many of the pathognomonic symptoms it exhibits.

If any portion of the body may be considered of paramount importance, it is undoubtedly the blood, for through its agency all the phenomena of life are accomplished; by its means the different portions of the animal frame are nourished, and it is in itself the centre of the most important changes. Hence the value of a careful study of its composition and properties in the investigation of the nature of any disease.

As the blood receives all the crude nourishment introduced into the system, previously to its becoming a part of the solid framework, and prepares such for its destination; as it is also the receiver of the products of the metamorphoses of the tissues; there will necessarily be found among its constituent matters to be prepared and made fit for nutrition; principles already perfected; and besides these, various effete matters destined for excretion. These latter, in health, exist in the blood, only in the most minute traces, from the perfection and activity of the excreting organs.

The annexed table, exhibiting the composition of healthy blood in the 1000 parts will facilitate the clear comprehension of the changes which this fluid undergoes in gout.

Clot.	Globulin 123·5	constituting the red corpuscles	131·0
	Hæmatin 70·5		
	Fibrin		2·2
Serum sp. gr. 1029 alkaline.	Albumen		70·0
	Salts: Phosphate of soda, lime, magnesia, and iron; Sulphate of potash; Chlorides of sodium and potassium, silica, &c.		6·0
	Fats: Margarine, Oleine, Seroline, Cholesterine, Phosphureted Fats, &c.		1·3
	Unknown substances, called extractive matters, with traces of urea, uric acid, creatine, &c.		5·5
	Water		784.0
	Oxygen, Carbonic acid, Nitrogen	dissolved in the fluid.	

Do the normal constituents of the blood become altered in gout, or are matters naturally excrementitious retained in the fluid, thereby influencing its composition?

The *globules* or red corpuscles are not necessarily altered; in acute gout they may remain in the normal proportion, but in many chronic and asthenic cases they are notably diminished, as they would be in weakened and depraved conditions of the habit arising from any other cause. In gout occurring in painters, plumbers, and other workers in lead, it is common to find considerable diminution of the globules; this is not the effect of gout, but is dependent on the metallic

impregnation, for one of the earliest effects of the absorption of lead into the system is to produce anæmia.

The *fibrin* undergoes the same variations as in other inflammatory diseases. When a patient is suffering from considerable local inflammation it is increased in quantity, even to four, five, or six parts in 1000, the augmentation being in proportion to the intensity of the inflammation; but in chronic gout it may remain in its normal proportion, or be only very slightly raised. The variation in the fibrin appears, therefore, to have no relation to gout as such, but to depend simply on the development of inflammation from the morbid condition of the habit; it follows, therefore, that the blood when drawn from a gouty patient may exhibit the phenomena of being buffed, or buffed and cupped, or it may present nothing abnormal.

The *serum* is not necessarily altered in physical characters; its specific gravity may remain at the normal figure, and its colour and consistence as in health: still, from the results of an extensive table showing the weight of this fluid in different diseases, I am of opinion that in gouty cases the mean specific gravity is lower than in most other affections; in fact than in all diseases, with the exception of albuminuria and true scorbutus. In cases of acute gout occurring in robust subjects, the blood does not show this phenomenon; in fact it occurs only in patients who have long suffered from it, or in cases of well-marked kidney affection. When treating of the condition of

the urine in gout, we shall show how common it is to find traces of albumen in the acute, and still more frequently in the chronic form of the disease, especially when accompanied with visible deposits of urate of soda; the diminution of the specific gravity of the serum depends, therefore, partly upon the loss of albumen by the kidneys. In scarcely any case of uncomplicated gout have I observed the weight of the serum below 1025, and the average in chronic cases has been from 1027 to 1028, a little lower than in health. I have never found the albumen of the blood increased in gout, although such has been occasionally assumed on mere hypothetical considerations. The variations in amount of the saline matters of the serum have not yet been made a subject of special investigation, a remark which applies equally to the fatty ingredients.

Where, then, shall we look for the morbid changes, seeing the normal constituents are not necessarily modified? It is in the augmentation of those principles which exist in health in such minute traces as to be detected with difficulty, that the peculiar alteration of the blood in this disease is manifested.

A severe case of gout came under my notice in University College Hospital, in the summer of 1847. The patient was a man about forty-one years of age, who had for the three previous years suffered from repeated fits of this disease, and exhibited several small chalk-stones about the palmar surfaces of his fingers, and a few spots in the ears. At the time of

admission into the hospital, he was labouring under a recent acute attack, and many joints in the right hand were inflamed and swollen. From several considerations I was induced to examine his blood, more especially with the object of ascertaining whether uric acid was present; for this purpose, through the kindness of Dr. C. J. B. Williams, under whose care the patient was placed, a small amount of the fluid was procured. The clot was found to be firm and somewhat buffed: the serum clear, alkaline in reaction, and of specific gravity 1028. Feeling assured that, if uric acid were present, it would be in the serum, 1000 grains of that fluid were dried in a water bath, reduced to powder, and boiled with rectified spirit, for the purpose of removing matters which might interfere with the separation of the uric acid, and after being thus exhausted it was treated with boiling distilled water.

When a few drops of the watery solution were evaporated to dryness with nitric acid, and held over the vapour of ammonia, distinct evidence of uric acid was afforded by the production of the beautiful purple tint of murexide or purpurate of ammonia; and when the solution was reduced to a thin syrupy consistence, and a few drops of hydrochloric acid added, and set aside, in a few hours uric acid was deposited in its usual characteristic crystalline form.

From a second quantity of blood drawn soon after the first, 1000 grains of serum were taken and treated in the same manner, except that no hydrochloric acid

was added. The concentrated watery solution was allowed to stand for some hours, when very numerous tufts of crystals were found deposited on the sides of the vessel and surface of the fluid. These crystals were proved to consist of urate of soda; they yielded rhombs of uric acid on the addition of hydrochloric acid, and when incinerated left an ash, alkaline in reaction, soluble in water, and not answering to the tests for potash.

These observations were soon afterwards repeated upon several cases of gout with uniform results, and published in the Transactions of the Medico-Chirurgical Society for 1848; and the following conclusion at that time drawn, viz., that "the blood in gout always contains uric acid in the form of urate of soda, which salt can be obtained from it in a crystalline state." From that time up to the present, a space of more than fourteen years, I have been in the habit of examining the blood in this disease when opportunity has presented itself, altogether in more than a hundred cases, and the only alteration I should feel disposed to make in the above would be to append the words, "in abnormal quantities;" as I have found that in health the merest traces both of uric acid and urea can now and then be detected by very great care in manipulation.

The results of several quantitative analyses which I made on the blood of gouty patients, in order to determine the amount of uric acid, are contained in the paper alluded to.

In the case of the man whose history is recorded, and in whose blood uric acid was first discovered, 1000 grains of the serum yielded 0·050 grain of uric acid.

In a second case the same quantity of serum gave 0·025 grain of uric acid.

In a third case 0·030 grain of uric acid was obtained from 1000 grains of serum.

In the blood of a fourth patient 1000 grains of serum yielded as much as 0·175 grain of uric acid.

In another case the history of which has been detailed in the chapter on chronic gout, 1000 grains of the serum yielded 0·11 grain of uric acid.

In all these determinations, the quantities obtained were probably much under the actual amounts, as considerable loss is liable to occur from unavoidable causes.

The process above described for determining uric acid requires considerable time and care, especially if any attempt be made to estimate the quantity; and hence, although it is a method most desirable to have recourse to in investigating the pathology of gout, yet it is one which cannot be readily employed in clinical medicine. To obviate this difficulty I have devised another mode of ascertaining the presence of uric acid in the blood, which I have been much in the habit of using clinically for the last ten years, and with the results of which I have reason to be well satisfied; it is likewise a method which can be readily employed by every medical practitioner, and which has the

advantage of requiring the abstraction of only a minute quantity of blood. I have named the process the "Uric Acid Thread Experiment," and it is thus performed:—Take from one to two fluid-drachms of the serum of blood, and put it into a flattened glass dish or capsule; those I prefer are about three inches in diameter, and one third of an inch in depth, which can be readily procured at any glass-house; to this add ordinary strong acetic acid, in the proportion of six minims to each fluid-drachm of serum, which causes the evolution of a few bubbles of gas. When the fluids are well mixed, introduce one or two ultimate fibres, about an inch in length, from a piece of unwashed huckaback or other linen fabric, which should be depressed by means of a small rod, as a probe or point of a pencil. The glass should then be put aside in a cool place, until the serum is quite set and almost dry; the mantel-piece in a room of the ordinary temperature, or a book-case, answers very well, the time varying from thirty-six to sixty hours, depending on the warmth and dryness of the atmosphere.

Should uric acid be present in the serum in quantities above a certain small amount noticed below, it will crystallise, and during its crystallisation will be attracted to the thread, and assume forms not unlike that presented by sugar-candy upon a string, as shown in Plate v., fig. 5, *a*, *b*, *c*; when in the dark field under polarised light it has an appearance represented in the woodcut, fig. 12. To observe

this, the glass containing the dried serum should be placed under a linear magnifying power of about fifty or sixty, procured with an inch object-glass and low eye-piece, or a single lens of one-sixth of an inch focus answers perfectly. The uric acid is found in the form of rhombs, the size of the crystals varying with the rapidity with which the drying of the serum has been effected, and the quantity of uric acid in the blood. To ensure perfect success, several precautions are necessary.

Fig. 12.*

1. The glasses should be broad and flat; watch-glasses of the ordinary kind are not suitable, being too small, allowing the fluid to be frequently spilt, and also too much curved, causing the film of partially dried serum to curl up and split.

2. The acetic acid should be neither very strong nor too weak. The glacial acid forms a gelatinous compound with the albumen of the serum, producing flakes; and very weak acid adds unnecessarily to the bulk of the fluid. By experience I find the ordinary strong acetic acid (about $\frac{28}{100}$) well suited for the experiment.

* Fig. 12 represents a fibre of thread with rhombs of uric acid adhering to it, as seen under polarised light with a linear magnifying power of 60, formed with an inch object-glass and low eye-piece.

3. The character and quality of the thread are of some moment. Very smooth substances, as hairs or fine wire, but imperfectly attract the crystals; if the number or length of the fibres be too great, and the amount of uric acid small, the crystals become much scattered, and therefore but few appear in the field of the microscope. The glass should not be disturbed during the drying of the serum, or the crystals may become detached from the thread.

4. Some attention to temperature is necessary; if the serum be evaporated at a high temperature, above 75° Fahrenheit for example, the drying may take place too rapidly to allow crystallisation; the temperature of an ordinary sitting-room answers well for the purpose; the glass should be protected from dust.

5. If the serum be allowed to dry too much before the examination takes place, the surface becomes covered with a white efflorescence consisting of feathery phosphates which may obscure the thread, and which are represented in Plate vi., fig. 4, *c*; they can be removed by the addition of a few drops of water before placing the glass under the microscope; sometimes over-drying causes the film to become cracked or fissured throughout, as well as covered with the phosphatic efflorescence.

6. It is well, when practicable, to put up two or more glasses with the same serum.

7. The blood should be recently drawn, or at least no change should be allowed to take place in it before the experiment is made, as uric acid when in contact

with albuminous principles is liable rapidly to undergo decomposition.

Degree of Delicacy of the above Test for Uric Acid.—The serum of healthy blood, as also of patients suffering from the majority of diseases, although usually containing a trace of uric acid, gives no indication of its presence by the "uric acid thread experiment;" and the absence of extreme delicacy in this test is a most valuable property. I have endeavoured to ascertain, by a series of experiments, the quantities of uric acid which must exist in blood before its presence can be thus demonstrated,* and for this purpose have added urate of soda, in certain definite proportions, to the serum of blood taken from a healthy subject.

1. Serum, with the addition of uric acid in the proportion of 0·010 grain in the 1000 grains	gave no indication of uric acid.
2. Serum, containing 0·020 grain in the 1000 grains	no crystals of uric acid deposited.
3. Serum, containing 0·025 grain in the 1000 grains	gave two or three crystals on thread.
4. Serum, containing 0·030 grain in the 1000 grains	gave a few crystals.
5. Serum, containing 0·040 grain in the 1000 grains	gave several crystals.
6. Serum, containing 0·050 grain in the 1000 grains	a moderate sprinkling of crystals on the thread.
7. Serum, containing 0·060 grain in the 1000 grains	the thread pretty freely covered with crystals.

* Medico-Chirurgical Transactions, vol. xxxvii.

8. Serum, containing 0·080 grain in the 1000 grains	very numerous crystals on thread.
9. Serum, containing 0·100 grain in the 1000 grains	abundance of crystals, more than usually found in serum.
10. Serum, containing 0·200 grain in the 1000 grains	thread completely covered with uric acid, and numerous crystals scattered throughout serum.

From this it appears, that an amount of uric acid equal to at least 0·025 grain in the 1000 grains of serum, in addition to the trace existing in health, is required before the "thread experiment" gives indication of its presence, and hence the appearance of uric acid on the thread is complete evidence of an abnormal quantity in the blood. In several experiments on the blood in gout and albuminuria, when quantitative determinations were made, the amount of uric acid in the 1000 grains of serum was found to vary from 0·045 to 0·175 grain.

Changes in the Uric Acid during decomposition of the Serum.—When enumerating the precautions which should be observed in the employment of the thread test, it was stated that recently drawn blood should be made use of; the importance of this precaution will be seen from the following observations, which were at first the cause of some perplexity. Having ascertained the presence of uric acid in the blood in several cases, and put aside the serum, I found, on repeating the experiment, that no indication of uric acid could

be discovered; this happened most frequently during the summer months. On closer examination I ascertained that the serum had undergone slight decomposition; this gave me a clue to the explanation of the phenomenon, namely, that the uric acid in the blood undergoes a species of fermentation, and is decomposed whenever the albuminous portion becomes altered. In order to verify this, the following experiment was made and repeated several times with uniform result.

Urate of soda was dissolved in serum in the proportion of from 0·10 grain to 0·30 grain to the 1000 grains, and the fluid allowed to become putrid, small portions being put into the glasses from time to time; it was found that the crystals, although very numerous at first, became fewer in number and soon disappeared altogether, proving the uric acid to have been gradually destroyed, and thus showing the extreme importance of using fresh serum, more especially in warm weather.

I have made some experiments in order to discover the changes which uric acid undergoes when subjected to such decomposition.

It is a well-known fact that when exposed to the action of certain oxidising agents, as the puce-coloured oxide of lead, uric acid is broken up into oxalic acid, urea, and allantoin, and when the oxide is in excess the oxalic acid is further oxidised and converted into carbonic acid; this fact led me to try whether oxalic acid may not be formed in the blood from a

change in the uric acid. For this purpose I made daily observations on serum rich in uric acid, and had evidence, during its decomposition, of the formation of oxalic acid, the occurrence of octahedral crystals of oxalate of lime. I have also evaporated the serum when decomposition was taking place, and obtained crystals of oxalate of lime. To make the experiment more conclusive, I have taken serum of blood free from an appreciable amount of uric acid, divided it into two parts, to one portion have added urate of soda, and then allowed both to decompose; it was found that in the serum to which the urate had been added, octahedral crystals of oxalate of lime were formed, but not in that free from uric acid. The microscopic examinations were made with amplifying powers of 200 to 400 linear. Much further investigation into this subject is required, but enough has been done to show that the study of these changes is not without interest to the pathologist, for there can be little doubt that oxalic acid is formed in the animal body, not, as formerly supposed, from the oxidation of saccharine matters, but from the decomposition of uric acid.

As before stated, I have made numerous determinations of the blood in cases of gout; in the subjoined Table some account of forty-seven of these will be found, and a perusal of them cannot fail to convince the reader that the articular affection under which the patients suffered was truly characteristic of the disease. Since the Table was constructed, I have had

numerous opportunities of confirming the results therein contained, but those already tabulated are quite sufficient to prove my original statement, that *the blood in gout is invariably rich in uric acid.*.

TABLE, *Exhibiting the History and Symptoms of 47 Cases of Blood.*

Name.	Age.	Occupation.	Habits of Life	Hereditary Predisposition	General state of Health.	No. of attacks.
W. F.	38	Gasfitter, occasionally musician. Has never had lead colic.	Drank much gin and beer or porter.	Father had gout or rheumatism. Mother's father gout, and all mother's brothers. Also own brother. (See below.)	Pretty good. Fractured ribs about six years ago; since then affected with present disease.	Numerous. Four or five well marked.
F. P.	43	Painter (House).	Drank freely, porter and gin. Not in great excess; often six pints of porter daily.	Apparently hereditary from father, who, however, died when patient was young.	Good, except when suffering from gout or lead colic.	Numerous. First attack eleven years since, first in ankle, next in great toe.
J. E.	64	Stonemason.	Not stated.	Not stated.	Good.	Numerous. First attack occurred twenty years since in some part of foot.
W. F.	40	Wine-cooper.	Has drunk freely of beer and gin.	Father and grandfather on same side had gout, and father had chalkstones.	Pretty good.	Numerous. First about ten years since, in feet and ankles.
C. F.	38	Brewer's Man.	Has drunk very freely, chiefly porter; some gin.	Father's brother had gout.	Good in general.	Not known; numerous. About ten years since had first attack, confined to foot.
C. F.	35	Painter.	Temperate; about two	See under W. F., case 1,	Pretty good, except from	Second attack. First,

Articular Affection, in which Uric Acid was present in the Cases of genuine Gout.

Cause of.	Symptoms during Attack.	State of Blood.
Much drinking before present attack.	Commenced in ball of left great toe; after four or five days, knees, elbows, hands, fingers, and left ankle, also left metacarpal and phalangeal joints affected. Pitting on pressure. Pulse 92, hard and full; tongue slightly furred; some thirst; deposits of urate of soda on palmar surface of left index finger. Not on ears.	Clot firm; serum alkaline; sp. gr. 1029·4 at 68° F.; much uric acid by thread experiments.
None assigned for the present.	Commenced in left knee, then dorsum of left hand, right hand, and both feet and ankles, small joints of hands. Pitting on pressure. Pulse 92, rather hard; tongue slightly furred; appetite pretty good. Deposits in both ears. No other deposits seen. No permanent mischief to joints.	Clot slightly buffed and contracted; serum alkaline; sp. gr. 1028·0 at 60° F.; abundance of uric acid. *Blister fluid* from inflamed joint; no trace of uric acid. *Blister fluid* from abdomen gave a moderate amount of uric acid.
Not stated.	Affection of hands, ankles, knees, hips. Pulse 80. Deposits in ears; and little nodules in integuments near eyes.	Uric acid in serum.
Patient has often brought on attacks by the use of port wine.	Commenced in knee, then elbow, and small joints of hands. Pitting on pressure. Pulse 76. No deposits of urate of soda noticed.	Serum contained a considerable quantity of uric acid.
None assigned.	Both feet, knees, hips, small joints of hands, and in great toe. Pitting on pressure. Pulse 80. No thirst. Minute concretions of urate of soda in left ear. Large semi-fluid collection in left foot of creamy urate of soda; some deposit also on right little finger.	Clot firm, buffed and cupped; serum alkaline; sp. gr. 1029·0 at 55° F.; abundance of uric acid. *Blister fluid* from inflamed part gave no trace of uric acid. *Blister fluid* from ankle, a few crystals of uric acid.
Injury. Struck by	Commenced two days after injury, in left elbow and fingers; after-	Clot normal; serum alkaline; sp. gr. 1026·8

Name.	Age.	Occupation.	Habits of Life	Hereditary Predisposition	General state of Health.	No. of attacks.
			pints of porter daily; formerly took spirits also.	the brother of the present patient.	present disease.	one year and a quarter since, commenced in left foot.
T. B.	54	Farrier.	Has always been a free drinker of beer and gin.	Father had gout, also one brother.	Good.	Has had numerous attacks. First in feet, seven or eight years since; does not remember whether the great toe was chiefly affected; great toes have been in some attacks.
J. H.	45	Publican for many years, formerly a post boy.	Intemperate. Drank much beer and gin. Good diet.	Father had gout, also brothers.	Good, except gouty.	Numerous. First about fourteen years since, in right great toe.
S. N.	68	Wheelwright.	Regular.	Not known. (Patient very deaf indeed.)	Pretty good.	About the twelfth. First attack in ball of left great toe, next in right great toe, afterwards in large joints also.
J. Z. R.	48	Stableman, formerly a soldier.	Lived freely, both in eating and drinking.	None.	Good.	About third attack. Twenty years since, swelling of ball of great toe; next attack

Cause of.	Symptoms during Attack.	State of Blood.
a shaft; and fracture of ribs and pleuritis.	wards both feet and right knee, and right index finger. Pitting on pressure. Pulse 108. Tongue furred; thirst. Fluid from right index finger (middle joint) obtained by puncture, milky from urate of soda (four days after it was inflamed); concretions afterwards appeared on right ear, and in left middle finger.	at 50° F.; abundance of uric acid. *Blister fluid* from chest, a moderate amount of uric acid.
Injury from the kick of a horse, on chest.	About forty-eight hours after injury the dorsum of right hand and foot, and left elbow, upon which he fell, became affected. Pitting on pressure. Pulse 80, full, hard; some thirst; appetite good. No deposits of urates.	Clot slightly buffed; serum alkaline; sp. gr. 1026·64 at 58° F. A good sprinkling of uric acid on thread.
Drink.	Ankles and feet chiefly affected. Pitting freely on pressure. One knee also much swollen; tongue clean; appetite good; no thirst. Pulse 76, not resisting. Nodules of urate of soda on both ears.	Clot normal; serum alkaline; sp. gr. 1029·6 at 47° F. Abundance of uric acid by thread experiment.
Not given.	Great toes both affected; left knee slightly; patient has eczema of both legs. Pulse 92. Appetite good. No deposits of urate of soda.	Clot normal; serum alkaline; sp. gr. 1026·0 at 65° F. Considerable sprinkling of uric acid on thread.
Not assigned.	Commenced in right knee, then hip, shoulders, hands, left knee, balls of both great toes became implicated. Pulse 110, rather hard; tongue white, furred. Pitting on pressure. No deposits of urate of soda on any part of body.	Clot normal; serum alkaline; sp. gr. 1028·0 at 60° F. A few crystals of uric acid. *Blister fluid* gave crystals of uric acid. *Blister fluid* from inflamed knee, no crystals of uric acid.

Name.	Age.	Occupation.	Habits of Life	Hereditary Predisposition.	General state of Health.	No. of attacks.
						commenced also in great toe.
G. H.	56	Traveller.	Temperate but has drunk much porter; half a gallon or more per diem.	Not known.	Good.	About sixth attack. First confined to right great toe, ten years since. Other joints afterwards affected.
G. H.	52	Cab-driver and proprietor.		No gout or rheumatism from father or mother; but uncles and aunts on both sides subject to gout.	Good, except gout.	Numerous. First attack thirty years ago, in feet; second attack in ball of both great toes. Knees not affected until two years since; and last year upper extremities.
J. S.	61	Pianoforte-maker.	Lived well; drank moderately of beer and some gin.	None.	Good, except occasional gout, and latterly some albuminuria.	First attack of gout about twenty years since.
C. H.	46	Coachman. Last three	Has drunk freely of	None.	Good, except subject to	Numerous. First attack

Cause of.	Symptoms during Attack.	State of Blood.
		Second bleeding two days after: Clot not buffed, or cupped; serum alkaline; sp. gr. 1027·1 at 65° F. Pretty good quantity of uric acid. Third bleeding eight days after: Clot firm; fibrinous coat; serum gave a moderate amount of uric acid by uric acid thread experiment.
Was exposed much to cold before present attack.	Commenced in right foot, then left foot, right knee, and hand; left shoulder and hand. Pitting on pressure. Pulse 108, hard; tongue white, furred. No deposits of urates.	Serum gave abundance of uric acid.
None assigned.	Affection of left elbow, wrist, and metacarpal joint of index finger. No deposits of urates. Pulse 86; tongue furred; no appetite. Pitting on pressure.	Clot buffed, firm; serum alkaline; sp. gr. 1025·56 at 64° F. Pretty good sprinkling of uric acid by thread experiment.
Present attack came on after some chest affection.	First examination of blood some little time before the joints became affected. Patient then suffering from chest symptoms and slight edema. Second examination after attack had completely passed off. During attack the right great toe and knee were affected. Pitting on pressure. Had albuminuria, gradually lessening to a mere trace.	First examination: Clot normal; serum alkaline; sp. gr. 1021·6 at 66° F. A good quantity of uric acid; thread studded with crystals. Second examination: Clot normal; serum alkaline; sp. gr. 1022·4 at 66° F. A very few crystals of uric acid.
None assigned.	Commenced thirteen weeks before admission, then partially recovered;	First examination: Clot firm, buffed; se-

Name.	Age.	Occupation.	Habits of Life	Hereditary Predisposition	General state of Health.	No of attacks.
		years a cab-man.	beer and gin.		attacks like the present.	about twenty years since in right great toe and instep only. Second attack, sixteen years since, in same part. Third, twelve years since in left great toe. In subsequent attacks knees and elbows. Attacks gradually increasing in frequency.
J. B.	60	Excavator.	Drinks freely.	None.	Good.	Fourth attack. First, commenced in right great toe.
F. W.	47	Gentleman's servant.	Lived pretty freely. Drank beer chiefly.	None clearly discoverable.	Pretty good, except from gout.	Numerous. Early attacks commenced in great toe.
J. Q.	58	Has been for a long time a brewer's drayman.	Drank very freely of beer and gin.	None distinctly discoverable.	Pretty good until the last few years.	Numerous.
M. C.	60	Tradesman.	Drank freely, beer, &c.	Not known.	Good, until gout appeared.	Very numerous indeed.

Cause of.	Symptoms during Attack.	State of Blood.
	for three weeks has kept his bed. Hands, knuckles, knees, feet, and shoulders affected. Pulse 72, full, hard. No deposits of urate of soda. The first examination of the blood was made during febrile disturbance of the system; the second when the patient had pain in joints, but no fever.	rum; sp. gr. 1026·0 at 66° F. No uric acid found by thread experiment. Second examination: Clot normal; serum alkaline; sp. gr. 1024·8 at 65° F. A moderate amount of uric acid.
Appears to have had attacks every one or two years.	Dorsum of left wrist, hand, metacarpal and several phalangeal joints, and swelling of right side of face. Pitting of parts on pressure. Pulse 72. No deposits of urate of soda in any part of body.	Clot buffed, firm; serum clear, alkaline; uric acid thread experiment gave abundance of uric acid.
Cold. Taking hard beer.	Pains of fingers, wrist, elbow, and shoulder of left side; then same on right side; left great toe, right knee. Pulse 104, rather full and sharp. Some thirst, moderate appetite. Pitting on pressure. Desquamation of cuticle. No deposits of urate of soda.	Serum; gave by uric acid thread experiment uric acid on thread; serum of blood from loins by cupping gave also the same.
Drink brings on an attack.	Left hand and arm, and knees, slightly affected. Pulse 80. Pitting on pressure. Several small deposits of urate of soda in ears; and much distortion of small joints of feet and hands.	Clot not buffed; serum clear, alkaline; sp. gr. 1027·5 at 54° F.; uric acid thread experiment gave much uric acid on thread. About 0·07 grain collected by analysis from 1000 grains of serum.
The present attack seemed to be brought on by mental anxiety.	Present attack chiefly in head; delirium, heat of head, &c. Many of the smaller joints of feet and hands much distorted. No distinct deposits of urates.	Blood by cupping from loins; clot firm; serum clear; sp. gr. 1029·2 at 70° F.; uric acid thread experiment gave abundance of uric acid.

Name.	Age.	Occupation.	Habits of Life	Hereditary Predisposition	General state of Health.	No. of attacks
T. M. April, 1854.	53	Cook.	Eats freely of meat; has drunk pretty freely of beer. Not intemperate.	None known.	Good except when gouty.	Almost innumerable. First commenced in right great toe about twenty years since. For some time the disease attacked great toes only.
Idem. Feb. 1850.						
Idem. Nov. 1849.						
G. R.	31	Cabman for many years.	Drinks freely of beer, some spirits.	None.	Good before present affection.	About six; has had joint affection without fever.
W. M.	52	Printer.	Before having gout, drank rather freely of gin, some beer; lived well.	None known; but one younger brother has gout.	Good until fourteen years since.	Very numerous. First attack in right great toe, about twelve years since. Second attack a year after, in great toe also. Upper extremities have not been affected for more

Cause of.	Symptoms during Attack.	State of Blood.
None assigned for any one attack.	This patient has had at different times all the joints of the body acutely inflamed, sometimes the larger, sometimes the smaller, chiefly affected in the attack. There is always much pitting on pressure. The pulse during acute attacks becomes quick and hard. Nodules of urate of soda on both ears; and chalk stones on many parts of body, both upper and lower extremities. Sometimes discharges of this urate, and formation of abscesses take place.	Clot buffed, and slightly cupped; serum clear, alkaline; sp. gr. 1027·12 at 60° F. By uric acid thread experiment a considerable amount of uric acid was obtained.
		Blood by cupping from loins; serum clear, alkaline; sp. gr. 1026·0 at 53° F. Uric acid thread experiment gave abundance of uric acid.
		Clot firm and large; serum clear, alkaline; sp. gr. 1029·1 at 50° F. By uric acid thread experiment an abundance of uric acid; from 1000 grains 0·04 grain collected.
	No swelling of joints. Symptoms subjective only. Appetite good. No thirst. Pulse 70. Complains of pains in joints, and stiffness in walking, which he has had several months.	Clot not buffed, not very firm; serum alkaline; sp. gr. 1027·4 at 63° F. A moderate amount of uric acid.
Not assigned for any one attack.	At various times, different joints affected, sometimes nearly all together. Great toes, and smaller joints of fingers, as well as large joints. Patient covered with concretions of urate of soda; many in ears; much crippled.	March, 1853.—Acute attack; clot cupped and buffed; serum alkaline; sp. gr. 1026·4 at 51° F. Abundance of uric acid, shown by uric acid thread experiment. *Blister fluid* gave uric acid. Vomited matters produced by colchicum gave no uric acid.
		July, 1852. — Acute attack; clot firm, buffed; serum alkaline; sp. gr. 1026·0. Gave uric acid

Name.	Age.	Occupation.	Habits of Life	Hereditary Predisposition	General state of Health.	No. of attacks.
						than six years, nor concretions visible more than three years.
H. U.	50	Painter.	Irregular.	None known.	Good until he had painters' colic.	Numerous. First attack about three or four years since, in feet.
J. T.	42	Ginger-beer maker.	Takes beer freely, sometimes a little gin, but not intemperate.	None.	Pretty good, except gout.	Numerous. First attack about ten years since; very frequent within last five years. Not noticed in history which joint was affected in first attack.
W. B.	52	Coachman in gentlemen's families for many years.	Drank pretty freely at one time, chiefly wine.	None known.	Good, until first attack of gout.	Very numerous, had suffered for many years. Came on first in great toe.
T. M.	41	Porter; formerly in the army.	Regular.	None.	Pretty good; had some injury from poisoned wound, a few years since.	Third attack.

Cause of.	Symptoms during Attack.	State of Blood.
		in abundance on thread. Jan. 1851. — Acute attack. Abundance of uric acid in blood.
Attack clearly induced by drink.	Present attack chiefly affects joints of hands; but knees and feet stiff and painful. Concretions in ears and around some joints.	Blood serum contains abundance of uric acid.
A glass of rum will induce an attack. Over fatigue appeared to have brought on the present.	Commenced in hands; then knees, ankles, &c., became affected. Deposits of urate of soda in ears only.	Clot large and firm, buffed; serum alkaline; sp. gr. 1027·2 at 60° F. 1000 grs. of serum gave 0·044 grain of uric acid.
Any depressing cause, or drink, will induce a fresh attack.	Scarcely ever free from some acute affection in one or more joints. Concretions in hands, feet, elbows, &c., and ears. Gouty abscesses, generally discharging more or less creamy urate of soda.	Clot normal; serum alkaline; sp. gr. 1030·0 at 60° F. 1000 grains of serum gave of uric acid 0·11 grain.
Not known.	Commenced at midnight, in the ball of left great toe. Pulse 100, rather hard. Tongue furred. Appetite pretty good. Afterwards desquamation of skin over ball of toe. No deposits of urates on any part of body.	Clot normal; serum alkaline; sp. gr. 1026·0 at 70° F. Abundance of uric acid by thread experiment. Second bleeding, attack passed off; clot normal; serum alkaline; sp. gr. 1024·0 at 53° F. A few crystals of uric acid. After leaving hospital, clot normal; serum pale; sp. gr. 1027 at 60° F. A few crystals of uric acid.

Name.	Age.	Occupation.	Habits of Life	Hereditary Predisposition	General state of Health.	No. of attacks.
W. R.	32	House painter.	Diet good; not intemperate, but drinks beer.	Father had gout, brother suffers also from gout.	Repeatedly had lead colic. Gout for six or seven years; commenced in ball of great toe.	Numerous. For seven months has not been free from gout.
W. B.	46	Coal porter.	Good living; a considerable amount of porter per diem.	Father affected with gout.	Good.	First attack. Re-attack about three weeks after. Second attack.
J. D.	27	Farrier.	Regular. Diet good; takes a considerable quantity of beer, and some gin.	None.	Good.	First attack.
J. C.	30	House painter for ten years, before a plumber.	Irregular; has drunk much porter and spirits.	One grandfather and father subject to gout.	Not good, from frequent syphilitic affections; gout and painters' colic.	Ninth or tenth attack. First commenced in great toe.
B. F.	38	Brick layer.	Pretty regular, but drinks freely of gin and beer.	None.	Good.	Fifth or sixth. First, two years since, commenced in great toe.
H. C.	51	Grocer.	Regular.	Not known. Not noticed in case books.	Suffers from bronchitis and emphysema, and from occasional attacks of gout.	Numerous.

Cause of.	Symptoms during Attack.	State of Blood.
Subject to exposure to cold.	Right foot, great toe, both ankles, knees, right wrist, middle finger of left hand inflamed. Tongue clean. No thirst. Appetite good. Pulse 95. Much pitting of swollen joints. No deposits visible on any part of body. No distortion of joints.	Clot rather cupped; serum alkaline; sp. gr. 1028·0 at 41° F. Abundance of uric acid by thread experiment. *Blister serum*, on partial recovery, yielded a moderate amount of uric acid. Second bleeding, clot normal. A moderate amount of uric acid in blood.
Much right work lately; Much exposed to cold.	Commenced at night in ball of left great toe, then outer side of ankle. Considerable pitting on pressure. Pulse slow. Appetite pretty good. No deposits of urates. Same parts affected as before, and right great toe in addition.	Serum gave much uric acid by thread experiment. Clot normal; serum, sp. gr. 1028·6 at 52° F. Serum of blood gave much uric acid by thread experiment.
Exposed to changes of temperature at work.	Commenced in right ankle, then left wrist, right knee, and right wrist; same affection of ball of right great toe. Pulse 64. No pitting noticed in notes. No deposits on any part of body. Joint affection *immediately* cured when colchicum was administered. Prior treatment gave no relief.	Clot normal; serum alkaline; sp. gr. 1027·6 at 55° F. Abundance of uric acid. *Blister fluid* clear, no coagula. No uric acid. Small quantity only procured, and that from an inflamed joint.
Attacks brought on distinctly by drink.	Toes, ankles, fingers, and wrists. Desquamation of cuticle. Pitting on pressure. Pulse 66. Appetite bad. Blue line on gums. A small deposit of urate of soda in left ear; some distortion of joints.	Clot buffed, not cupped; serum alkaline; sp. gr. 1026·4 at 49° F. Abundance of uric acid by uric acid thread experiment.
Patient thinks exposure to wet and cold.	Commenced in left knee and foot, then right great toe, afterwards both hands, especially index finger of left. Pitting on pressure, and desquamation of cuticle. Pulse 96, sharp. Appetite good. No deposits of urates on any part of body.	Serum clear; sp. gr. 1027. Abundance of uric acid by thread experiment.
After an attack of bronchitis, which it greatly relieved.	Commenced in ball of left great toe, afterwards left knee. Pitting on pressure. Pulse 108, sharp. No deposits of urates on any part of body. At the time of second bleeding, patient suffered from dyspeptic symptoms.	Clot normal; serum alkaline; sp. gr. 1029·2 at 52° F. Thread well sprinkled with uric acid. A former bleeding also gave much uric acid just before joint affection appeared.

FEMALES.

Name.	Age.	Occupation.	Habits of life.	Hereditary Predisposition.	General state of Health.	No. of attacks.
E. W.	51	Laundress; a widow.	Regular.	Father had some joint affection in knees and feet. One brother also, with white deposits and crippled limbs.	Good, till within last ten years.	Numerous. First attack about ten years since; knees were affected. Another attack some months afterwards.
M. J.	53	Servant.	Regular, but has lived rather hard at times.	Mother had gout and chalk stones.	Not very good. Phthisical. Died a few months afterward s from ches disease.	First attack.

FEMALES.

Cause of.	Symptoms during Attack.	State of Blood.
None assigned.	Commenced in knees, then ankles, elbows, wrists, and fingers. Pulse 92, rather hard. No deposits of urate of soda.	Clot firm, buffed; serum alkaline; sp. gr. 1028·0 at 65° F. A considerable amount of uric acid by thread experiments.
	Affecting the left index finger first, then wrist and shoulders, chiefly small joints of right hand; left knee and instep. Desquamation of cuticle. No deposits of urate of soda.	Clot firm, slightly buffed; serum alkaline; sp. gr. 1029·2 at 46° F. Much uric acid by uric acid thread experiment. Abundance of uric acid found in *serum from blister*, by uric acid thread experiment.
Not assigned.	Commenced about six weeks ago in ball of both great toes, afterwards knee, when bled, joint disease was not at all intense. Pitting on pressure. No concretions of urates of soda.	Clot cupped and buffed; serum alkaline; sp. gr. 1026·8 at 60° F. A moderate amount (small) of uric acid. *Blister serum* alkaline; sp. gr. 1024·0 at 65° F. A few crystals of uric acid. Second bleeding, clot buffed and cupped; serum alkaline; sp. gr. 1027·8 at 62° F. A pretty good sprinkling of uric acid on thread.

Cases of which the minute details were less known.

Name.	Sex.	Account of Patient.	State of Blood.
C. B.	M.	Attack present about three weeks. Undoubted gouty patient. No concretions noticed.	Serum alkaline : sp. gr. 1031·0 at 60° F. 1000 grains gave of uric acid 0·05 grain.
W. M.	M.	Acute attack. Chronic disease of long standing. Always relieved by colchicum. Concretions in ears and joints.	Clot firm, not buffed : serum alkaline ; sp. gr. 1027·8 at 66° F. 1000 grains gave of uric acid 0·062 grain.
U. N.	M.	A patient with gout of great toe and foot.	Serum alkaline ; sp. gr. 1031·5 at 60° F. 1000 grains gave of uric acid 0·044 grain.
J. N.	M.	Patient with great toe gout.	A small quantity of blood taken. Gave abundance of crystals of uric acid.
T. P.	M.	A painter (wrists and hands affected), gout for ten years. Last attack one year since.	Serum alkaline ; 1000 grains gave of uric acid 0·05 grain.
T. H.	M.	Gout. Attack now in right hand. Several deposits of urate of soda in both ears. Œdema of inflamed parts.	Clot firm, buffed ; serum alkaline ; sp. gr. 1028·2 at 70° F. Abundance of uric acid.
M. H.	M.	Patient diagnosed to have gout by a physician.	Clot firm, buffed ; serum alkaline. Gave much uric acid by uric acid thread experiment.
J. H.	M.	Gout for many years. Large joints now chiefly affected. Has had great toe affection. Deposits in both ears ; but not elsewhere noticed.	Serum of blood contained much uric acid.

Name.	Sex.	Account of Patient.	State of Blood.
C. H.	M.	A patient who has suffered many years from undoubted gouty attacks, bled on account of retrocedence of the affection.	Serum alkaline; sp. gr. 1030·1 at 45° F. Gave much uric acid by uric acid thread experiment.
E. P.	M.	Disease diagnosed as true gout by a physician. Attack disappearing rapidly.	Serum gave uric acid crystals on thread. Not numerous.
D. P.	M.	Acute attack of gout; the first attack, in great toe for some days.	Serum alkaline; gave on thread abundance of uric acid.
C. S.	M.	Chronic gout. Great toe often alone affected. No deposits of urate of soda seen.	Blister serum gave uric acid by the thread experiment.
J. S.	M.	Painter. Gout of great toe, of two days' duration. Admitted for epileptic fits.	Clot firm, buffed; serum alkaline; sp. gr. 1028·0 at 65° F. Abundance of uric acid by thread experiment.
T. P.	M.	Gout, with many concretions in ears, and around joints. Died from fracture of femur.	Blood taken after death. Serum by uric acid thread experiment gave much uric acid.

Discovery of Uric Acid in the fluid artificially effused by the application of blistering agents.—Some years since an opportunity occurred which enabled me to show that where morbid effusions take place in patients, whose blood is rich in uric acid, these likewise contain it; this fact was proved as regards the fluid from the pericardium and peritoneum,* but such knowledge could not be made available for any

* Medico-Chirurgical Transactions, vol. xxxvii. 1854.

practical purpose. It frequently happens that, for for the sake of diagnosis, it is desirable to ascertain the condition of the blood, as to the presence or absence of uric acid, in cases where from the state of the patient or other causes, venesection cannot well be employed, and it occurred to me that probably the fluid *artificially* effused by the application of a blister would contain this acid, if the circulating fluid were impregnated with it; experience proved the truth of this conjecture. The following are some of the results obtained by the use of the thread experiment, a test which may be employed for the discovery of uric acid in blister as well as in blood serum.

E. W. Feb. 9, 1853.	Serum of blood; sp. gr. 1029·2 at 46° Fahr. Abundance of uric acid on thread.	E. W. Feb. 11.	Serum of blister. Abundance of uric acid.
J. W. March 5.	Serum of blood; sp. gr. 1026·4 at 51° Fahr. Abundance of uric acid.	J. W. March 6.	Serum of blister. Abundance of uric acid.
— R. March 25.	Serum of blood; sp. gr. 1023 at 41° Fahr. Abundance of uric acid.	J. W. March 28. Attack passing off.	Serum of blister; sp. gr. 1022·8 at 46° Fahr. Crystals of uric acid.
J. H. March 29.	Serum of blood; sp. gr. 1029·6 at 47° Fahr. Abundance of uric acid.	J. H. April 1.	Serum of blister; sp. gr. 1024·8 at 54° Fahr. Abundance of uric acid.
C. S. June 30.	No blood taken.	C. S. June 30.	Serum of blister. Numerous crystals of uric acid.
M. J. Nov. 8.	Serum of blood; sp. gr. 1026·8 at 62° Fahr. Crystals of uric acid not very numerous.	M. J. Nov. 11.	Serum of blister; sp. gr. 1024 at 65° Fahr. Crystals of uric acid, several in number.

C. F. Jan. 2, 1854.	Serum of blood; sp. gr. 1026·8 at 50° Fahr. Abundance of uric acid.	C. F. Jan. 13.	Serum of blister; moderate amount of uric acid.

It appears from the above observations that the fluid effused by the action of a blistering agent applied to the skin, will give evidence of the presence of uric acid when the blood from the same patient exhibits the phenomenon. In the performance of the thread experiment, similar precautions must be adopted as for blood-serum; but, in addition, the application of the blister to an inflamed surface should be avoided, as the existence of inflammation, at least of a gouty character, has the power of destroying the uric acid, and preventing its appearance in the serum;* this fact is proved by the subjoined observations.

C. F. Jan. 2. 1854.	Serum of blood. Abundance of uric acid.	C. F. Jan. 2.	Serum from blister on the dorsum of the hand inflamed with gout. No trace of uric acid.
F. P. Jan. 15, 1854.	Serum of blood. Abundance of uric acid.	F. P.	Serum from blister on inflamed (gouty) knee. No trace of uric acid.
C. C. F. Dec. 21, 1853.	Serum of blood. Abundance of uric acid.	C. C. F. Dec. 23.	Serum from blister on inflamed (gouty) knee. No trace of uric acid.

During the crystallisation of uric acid in artificially effused fluids, a form somewhat differing from that which occurs in blood-serum is apt to be assumed, as

* The slight inflammation produced by a blister does not appear to destroy much of the uric acid.

the crystals have a greater tendency to agglutinate and form irregular masses.

Should further inquiries confirm the conclusion to which the above limited number of observations point, that during the existence of gouty inflammation there is a gradual destruction of the uric acid in the blood, and other independent researches which I have made appear to favour this idea, it will throw no small light on the pathology of gout, and explain the reason of the improvement in the general health which frequently follows a severe and prolonged fit of the malady.

Urea in the Blood in cases of gout.—In the Medico-Chirurgical Transactions for 1848, I gave the result of some investigations made on the blood in gout in reference to its containing urea, and came to the conclusion that this principle is sometimes present in excess, although not in quantities at all equal to what is found in albuminuria; at the same time it was suggested that the urea being retained in small amounts might explain one of the symptoms of gouty inflammation, namely, the frequent presence of slight œdema; since this period I have made further observations, all confirming my original statement. Dr. William Budd, in a paper published in the same Transactions in 1855, confirmed my observations, though he ascribed the presence of urea to the decomposition of uric acid, and not to any defect in the excreting power of the kidneys; but such an explanation is totally insufficient to account for the accumu-

lation, provided the function of the renal organs remains intact. Dr. Budd gives details of two cases, and mentions that he has detected urea either in the blood or blister serum of seven other persons suffering from acute gout, in none of which was albumen found in the urine, nor was there any other indication of the presence of renal disease. It will be seen, however, further on, that a trace of albumen is frequently present in the urine during the height of a gouty paroxysm, though not discoverable at any other period.

We may conclude from these observations, that urea is often contained in abnormal quantities in the blood in gout; whether it is so in the very early attacks has yet to be determined, but of this we are certain, that at such times we always find uric acid in excess.

Occurrence of Oxalic Acid in gouty blood.—Some years since* I detected oxalic acid in the blood of a patient labouring under albuminuria: whether or not he had suffered from gout I am unable to say. The acid was separated from the watery solution of the serum, mostly in the form of octohedral crystals of oxalate of lime, but mixed with small oval bodies somewhat resembling the dumb-bell varieties of this salt (Plate 6, fig. 3, *a*, *c*). I have also examined the blood for this acid in many cases of gout, and have frequently detected it; my impression is that it chiefly occurs during the inflammatory stage of the disease,

* Medico-Chirurgical Transactions, vol. xxxii. 1849.

and is probably derived from the oxidation of the uric acid.

The whole subject, however, is beset with difficulties, and, until many other observations have been made, I should not wish to venture any positive statement, except as to the fact of the frequent occurrence of oxalic acid in the blood of gouty subjects.

Traces of Uric Acid and Urea in healthy blood.—In 1848, in the postscript to my communication in the Medico-Chirurgical Transactions already referred to, I stated that I had not only discovered uric acid in the blood of gouty patients, but had found it also in healthy human blood. This statement having been somewhat misunderstood, it may be well to explain my views more fully.

It has been asserted that, as uric acid has been found in the blood in health as well as in gout, the importance of the latter fact becomes greatly diminished, but, on due consideration, this deduction will be found erroneous. In health, mere traces exist; quantities which require the employment of a large amount of blood, and the most careful chemical manipulation, to enable us to detect even its presence, and which cannot be shown by the thread experiment. The same objection might, with equal truth, be urged against the value of the presence of urea in cases of albuminuria, because I have also detected this principle in healthy blood; the difference in the amount, however, in the two cases, is very great. Traces of all the principles contained in the urine are probably

present in the blood, although it is only from defective excretion that they accumulate in sufficient quantities to become the source of disease.

Carbonic acid is a natural constituent of the atmosphere, and also of the blood, but it is only when its proportion is increased beyond a certain limit, that it proves injurious to the functions of the animal economy.

Secretion from the skin in gout.—There are many instances on record in which a whitish powder has been noticed as occurring on the skin of gouty patients, especially after profuse perspiration, and it has been frequently supposed to consist of some combination of uric acid, but in most cases assumed rather than proved to be urate of soda. Swediaur stated that he had seen a patient, labouring under a severe gouty paroxysm of several months' duration, with the entire surface of the body covered every morning with a white powder, as though he had been dusted with flour. Wolff thought he had detected uric acid in the perspiration from a patient suffering from calculus, and the same was stated to occur by Dr. Mayer, of Madras, in the case of a gentleman who also suffered from stone in the bladder, and suppression of urine. In the latter instance, I think the statement is open to doubt, as the acid was obtained from the shirt worn by the patient, who had recently had a blister applied to the back, and we have shown that blister serum is at times rich in this principle.

Dr. Golding Bird, in his work on urinary deposits,

also mentions having noticed the appearance of frosting, from microscopic crystals of urate of soda, on parts in which the exudation of an eczematous eruption had dried, the patient being bed-ridden from rheumatic gout, but it is not stated that these crystals were chemically examined. The most positive observations on this subject were made by Dr. Charles Petit, who affirmed that he had taken the cuticular secretion from the skin of gouty patients, occurring at the termination of an attack, and had it chemically examined by M. Henry. The first portion was from the hand of a patient fifty-six years of age, who had suffered from the disease from the age of twenty-four; it contained about four-fifths of its weight of albumen, some lactic and phosphoric acids, chloride of sodium, and phosphate of lime, together with sensible traces of urate of soda. In another instance, the matter was taken from the surface of the chest; in a third, from the back of the foot; in these specimens, also, M. Henry demonstrated the existence of urate of soda. Some objection, perhaps, might be urged against these results, especially when the matter was derived from the hands or feet; for if the patients were the subjects of deposits of urate of soda, a portion might possibly have been detached with the cuticle, as they frequently approach the surface, and even become exposed.

Some years since I adopted the following method to ascertain if uric acid is thrown out in the perspiration of gouty patients: A man was selected suffering from

a severe attack of gout; he had been subject to the disease for a long time, and had many tophi, or concretions of urate of soda; his blood also gave evidence of containing a large amount of this principle. Several folds of white bibulous paper were steeped in a weak solution of potash, and applied for about thirty hours to the abdomen, protected by oil-silk. The papers were rendered acid and found to be strongly impregnated with the perspiration and to contain much organic matter; they were treated with rectified spirit, and afterwards with hot water, and the watery solution, when evaporated, carefully examined for uric acid. No trace of this body could be discerned by the murexide test, nor any crystals separated by the addition of acetic acid.

More recently I have made two other observations with reference to this subject: A man was selected, suffering severely from gout, with extensive deposits of urate of soda in different parts, the great toe being greatly affected, as shown in Plate 1, fig. 3. The cuticle from this part being very thick, was detached, and after digestion in alcohol, treated with warm water; the watery solution was then evaporated, and acetic acid added. After remaining for some hours, a very few microscopic crystals of uric acid were discovered. In this experiment some error may have arisen from the very close proximity of the deposits of chalky matter to the surface, a fact well indicated in the drawing.

In the second case the hand, fore-arm, and arm of

a gouty patient were placed in a very long and wide glass jar, the vapour being prevented from escaping by means of caoutchouc sheeting attached to the arm; a considerable quantity of the perspiration, amounting to several drachms, was thus collected and subjected to analysis. No uric acid could be discovered either in the form of crystals or by the murexide test; but in lieu of this body a considerable quantity of *oxalate of lime* was found, a portion of which had crystallised on a fibre in the evaporated liquid, and exhibited the appearance seen in Plate 5, fig. 6, from a drawing made at the time. It will be observed that the crystals are of the octahedral variety (Plate 6, fig. 3 *a*), and some are aggregated in the form of rudimentary calculi. The patient from whom the perspiration was taken was suffering from an acute attack of the disease, although the arm itself was not implicated; a large amount of uric acid was present in his blood.

After an investigation of the various conflicting statements, with regard to the secretion of uric acid by the skin, I feel desirous to pause, and await the result of more numerous observations, before giving a positive opinion. Considering the nature of the excretion from the skin, it would hardly seem probable that a body possessing the properties of uric acid should be thrown out with it, either in its free state, or in the form of a salt; but, on the other hand, I could easily imagine that the fluid from eczema, or, in fact, from any other cutaneous erup-

tion, when occurring in patients whose blood is rich in uric acid, would contain this principle, because such secretions are alkaline, and bear a close resemblance to the serum effused by the application of a blister.

CHAPTER V.

URINE IN GOUT:—CHARACTERS OF HEALTHY URINE—TABLE EXHIBITING THE COMPOSITION OF URINE AND THE DAILY ELIMINATION OF ITS DIFFERENT CONSTITUENTS—URIC ACID—THE MANNER IN WHICH IT EXISTS IN THE URINE—RELATION BETWEEN THE ACIDITY OF URINE AND THE URIC ACID CONTAINED IN IT—CONDITION OF THE URINE IN ACUTE GOUT—NO EXCESSIVE EXCRETION OF URIC ACID IN MANY CASES—ELIMINATION OF THE UREA BUT LITTLE INFLUENCED—URINE IN CHRONIC GOUT—DEFICIENT EXCRETION OF URIC ACID—NO MARKED DEFICIENCY IN THE EXCRETED UREA—FREQUENT PRESENCE OF SMALL AMOUNTS OF ALBUMEN—URINE OF GOUTY INDIVIDUALS IN THE INTERVALS OF THE FITS—PROBABLE EXPLANATION OF THE FREQUENT RETURNS OF GOUT—MICROSCOPIC CHARACTERS OF THE URINE IN DIFFERENT FORMS OF GOUT.

BEFORE attempting to explain what has hitherto been ascertained concerning the alterations of the urine in gout, or what, from our own observations and experiments, we have recently arrived at, it will be desirable briefly to bring under notice some of the more important properties of this secretion in the human subject.

The urine when first passed is of a bright amber colour, transparent, with a peculiar characteristic odour and distinct acid reaction, but when allowed to stand for a short time, a fine flocculent cloud is deposited, consisting of mucus with a few epithelium scales.

The urine is subject to numerous changes, both in appearance and composition, and hence the ancients, who only studied its physical appearances, gave

different names to the urine secreted at different periods of the day, as *urina potûs*, to that secreted shortly after ingesting a considerable quantity of drink; *urina cibi*, to the urine passed during the digestion of a solid meal; and *urina sanguinis*, to the urine secreted from the blood, and uninfluenced by food; the urina potûs has a pale colour, and low specific gravity, the urina cibi is both heavier and darker, whereas the urina sanguinis is intermediate in character.

The quantity of urine passed in the twenty-four hours is likewise subject to considerable variations, depending on many circumstances, as individual peculiarities, the amount of fluid ingested, and the condition of the atmosphere; it may be regarded as a rule, that between the skin and kidneys a vicarious action exists, and that when the secretion of the skin is large the urine is scanty, and vice versâ; still a pretty close approximation to the average may be arrived at. Dr. Prout considered that the daily quantity in summer is 30 fluid ounces, in winter 40 fluid ounces, giving as a mean 35 ounces; he also thought that the specific gravity in health varies from 1015 to 1025, the average being 1020. M. Becquerel gives as the average specific gravity of the urine of both sexes 1017, and the average quantity in the twenty-four hours about 46 fluid ounces, or twenty thousand grains.

Dr. Parkes, in his recent valuable work on the composition of the urine, gives as the mean quantity in twenty-four hours, 52½ fluid ounces. This number

was deduced from numerous observations made by different individuals in this country and abroad; the variations from the mean in any one day may be considerable, although where the health is perfect they seldom extend beyond that time.

In composition, urine may be represented as water holding in solution certain organic substances and salts. Some of the best analyses of the urine in health are those made by M. Becquerel on several individuals of both sexes, and especially valuable, inasmuch as they include, not only the composition of this fluid in the 1000 parts, but also the total elimination during the twenty-four hours.

The following table shows the results arrived at, reduced to English grains and fluid ounces:*

	Male.		Female.		Mean.	
	Urine of 24 hours.	In 1000 parts.	Urine of 24 hours.	In 1000 parts.	Urine of 24 hours.	In 1000 parts.
Quantity of urine . .	44 fl. oz.	1000	48 fl. oz.	1000	46 fl. oz.	1000
Density . .	1019		1015		1017	
Water . . .	18949·6	968·8	20642·8	975·1	19796·2	971·9
Solids . . .	609·9	31·2	528·0	24·9	568·9	28·1
Urea . . .	270·7	13·8	240·4	10·4	255·5	12·1
Uric acid . .	7·6	0·4	8·6	0·4	8·1	0·4
Fixed salts .	150·5	7·7	130·0	6·1	140·3	6·9
Organic and Volatile Saline Matters	181·1	9·3	149·0	8·0	165·0	8·6

* Séméïotique des Urines, par M. Becquerel.

Under the head of *fixed salts*, chlorides, phosphates and sulphates of potash, soda, lime, and magnesia are included; and under *organic and volatile saline matters*, creatine and creatinine, hippuric acid, colouring, and many at present undefined extractive matters are grouped, with traces of ammonia salts.

As we shall dwell particularly upon the alterations of certain of these components, and especially of the uric acid and urea, when considering the urine of gouty subjects, it will be desirable to notice them a little more in detail, and also allude to some of the more important characters of the renal secretion.

The *specific gravity* or density of the urine varies with the amount of solid matters contained in it, but it must be remembered that we cannot, with any approach to accuracy, determine their quantity by the specific gravity alone, as the same weight of different substances dissolved in water gives to that fluid very different degrees of density. When the whole of the urine is collected, the diet of the patient remaining the same, then the density will give a somewhat close approximation to the quantity of solid elimination in the twenty-four hours. In the analyses we shall have to detail, the density is frequently stated, and tolerably accurate deductions as to the amount of solids may often thus be drawn.

The next property to consider is the *acidity* of the urine. It must be remembered that in health the secretion is acid, probably always so in perfect health, although at different periods of the day it is subject

to considerable variations, depending on the condition of the stomach with regard to the digestive process. It has been clearly shown by Dr. H. Bence Jones that immediately before each meal the urine exhibits the highest degree of acidity, and that which is passed two, three, or more hours after food always shows a much lower degree; the decrease being greatest three hours after breakfast, and five or six hours after dinner, when it reaches its lowest point. The acidity of the urine again increases until immediately before a meal, when it attains the highest limit; animal food causes a greater and more permanent decrease of acidity than vegetable. There is one fact that must be carefully borne in mind, namely, that the presence of *uric acid* has no influence upon the acidity of the urine, for this reaction probably depends, not on the existence of any free acid in the fluid, but upon the presence of the acid phosphate of soda, although in some cases of disease it is not unlikely that the occurrence of free acids may add to the acidity.

The *colour* of the urine in health is in the inverse ratio to the quantity passed. When the urine from any cause is scanty, the colour becomes deeper, and, on the contrary, when a large quantity is passed, it is much paler. In disease, the colouring matter is subject to considerable variation, not only in quantity, but in composition also.

The daily average of *urea*, according to the above table, is 258 grains, or 270·7 grains, in the male, and

240·4 in the female. Lehmann found, from experiments on his own person, that when living on a mixed diet he passed 500 grains; on an animal diet, as much as 819 grains; on a vegetable diet, 346 grains; and lastly, on non-nitrogenised food, 237 grains; but the averages of this physiologist are very large, not only for urea, but likewise for uric acid. In this country the average may be taken at about 500 grains when an individual is in perfect health, and is living well: we shall find many of the analyses for urea, detailed in the present chapter, fail to exhibit this amount; but as they were on the urine of patients who were kept on a moderately spare diet, on account of the affection under which they were labouring, we cannot conclude from this fact that the excreting power of the kidneys was deficient. Dr. Parkes gives 512·4 grains as the average daily elimination of urea by adult males, deduced from a very large number of analyses by English and foreign physiologists, the extremes being 286 and 688 grains.

Most of the analyses upon which we shall have occasion to comment having especial reference to *uric acid*, the consideration of this principle becomes invested with considerable interest and importance. We have seen from Becquerel's table, that eight grains is the average quantity passed by the healthy human subject, and many other investigators have arrived at a similar result; but uric acid is a body which in its free state is scarcely soluble in cold

water, requiring from twelve to fifteen thousand parts for solution; it is also very sparingly soluble in boiling water. How, then, does it exist in the urine, seeing that the quantity of water passed daily is not equal to the task of holding this eight grains in solution? Many and varied opinions have been advanced by different chemists to account for this fact. Berzelius considered that it is rendered soluble by the colouring matters of the secretion; Dr. Prout, that there exists an acid urate of ammonia in the urine, which imparts to it the acidity. It appears from more recent observations, that uric acid is present in the urine chiefly in the form of urate of soda, which is capable of existing without decomposition, in a solution of the acid phosphate of soda; hence it is evident that there is no necessary relation between the amount of acidity and the quantity of uric acid present in the urine. The experiments of Dr. Bence Jones appear to indicate that at the time the urine is very acid, there is but little uric acid present, and when uric acid exists in large quantities, the urine is sometimes neutral in reaction. It is likewise very important to bear in mind, that the presence of a urate deposit is no proof of an excess of uric acid in the urine, for urate of soda is held in solution in smaller or larger quantities in proportion to the acidity of the urine; this is readily shown by adding a drop or two of an acid, such as acetic acid, to a dense and almost neutral urine; if much uric acid be present, a copious cloudy deposit of urate of soda will immediately take place,

which is slowly converted into crystallised uric acid under the influence of the free acid which has been added. The same result often ensues, when a few drops of nitric acid are added in the cold to such urine, and the precipitate, which at first appears white and flaky, has often been mistaken for albumen.

Not unfrequently, if the urine be very acid, either from containing free acid at the time of its emission, or from its speedy formation, uric acid becomes deposited in the form of rhombs, more or less coloured and varying in shape. (Plate 6, fig. 1.) Urine which has given rise to such crystalline deposits, contains scarcely a trace of uric acid in solution; it is, in fact, in the same condition as when a foreign acid has been added.

Has clinical observation thrown any light upon the changes which occur in the urine in gout? In most of the works devoted to the consideration of the disease, little that is satisfactory can be found; some authors pass over the subject altogether, others content themselves with giving a very meagre account of the condition of this important fluid, and errors and discrepancies are constantly met with. Perhaps the most prevalent idea is, that uric acid is thrown out in excess, and in support of such view it is stated that copious deposits of uric acid and urates are so frequently seen in the urine of gouty patients that the appearance of brick-dust sediments has been regarded as almost characteristic of the urine in this disorder; added to which, there is a pre-

valent impression that gouty patients are liable to attacks of nephritic gravel, which would, at first sight, appear to strengthen the above generally received opinion.

This subject is treated more ably and fully by the late Sir C. Scudamore than any other writer, and the substance of his remarks may be seen in the following quotations: "The urine is of a deeper colour than natural, is secreted scantily with relation to the quantity of the patient's drink, and on cooling, deposits a pink or brick-dust sediment, with much mucus. The specific gravity is increased beyond the healthy standard. During the most urgent symptoms of the paroxysm it is usually passed with considerable irritation, both as to frequency and sense of heat. The pink or lateritious sediment appears more or less in every portion of the urine during the inflammatory symptoms."

This description of the condition of the urine is intended to apply to genuine acute gout, occurring in patients who have not previously suffered from the disease in its more chronic forms; for it is remarked in other parts of the same work, that "it is very commonly found, upon inquiry, that the patient has noticed a very deficient secretion of urine a short time before the occurrence of the paroxysm, and consequently it has been of a deeper colour than natural. It also now and then certainly occurs, that for a day or two before the fit, the urine is passed copiously and of a pale colour, but this seldom

happens except in persons of a nervous temperament, and whose constitutions have been much weakened by gout." Again, the same author observes, "A deposition of pink or brick-dust sediment on the cooling of the urine, is of such ordinary occurrence when any active symptoms of gout are present, that its connexion becomes forcibly impressed on the mind of the patient, and he gives it the name of gouty urine." These statements agree in the main with those of other writers who have noticed the condition of this secretion; but, on the other hand, it is observed by Sir C. Scudamore, that, "in several examples of chalk stones, both in the hands and feet, I have found by repeated experiments a deficiency, and sometimes total absence of uric acid in the urine. I must add, however, that even in patients of this class, during the paroxysm, this principle has existed in the urine in considerable quantity, and in some cases to the extent of a copious deposit of pink sediment."

The above statement as to the physical appearances of the urine in different forms of gout, are, I believe, essentially correct, and my own observations are not antagonistic to them, although I consider the deductions which have been usually drawn from them very erroneous.

M. Berthollet found that a few days prior to the access of a gouty paroxysm, the urine lost its natural *acidity*, but regained it before the termination of the fit. M. Fourcroy, in reference to these observations

of Berthollet, expressed a desire that the urine of gouty patients should be examined, to see whether the *uric acid* was likewise deficient during an attack of the disorder. In many works it has been asserted that M. Berthollet found the uric acid deficient or absent at such times; a statement which appears to have arisen from an idea that the acidity of the urine depended on the presence of the uric acid in it.

I shall divide my clinical examinations of the urine in gouty patients, made during the last fourteen years, into three classes :—

The first includes analyses of the urine in cases of acute gout; the second, examinations in patients suffering from the chronic form of the disease, and in the third class will be found the results obtained in gouty individuals at a time when there was an absence of any symptoms of their disorder.

CLASS I.—*Urine of subjects suffering from Acute Gout, in whom the general health had usually been good during the intervals of the paroxysms.*

In hospital practice there is considerable difficulty in procuring these cases; for few patients enter these institutions for a simple attack of acute gout, and there is often a great tendency, among the labouring classes, for the disease to assume after a short time an asthenic and chronic form; on the other hand, in private practice, it is not easy to procure the twenty-

four hours' urine, unless the patient himself takes an interest in the investigation.

Case 1. W. R., a male, aged 32, having no visible deposits of urate of soda upon the cartilages of the ears or elsewhere, has occasionally suffered from gout for seven years: in the first attack, the metatarso-phalangeal joints of both great toes were specially affected. At the time the urine was examined, the right foot and ankle and some of the smaller joints of the hands and the right wrist were inflamed with acute gout; there was also considerable febrile disturbance present.

March 24, 1853.—Urine of 24 hours, 35 fl. ounces; sp. gr. 1019. Clear.

Amount of uric acid in 24 hours = 5·95 grains.

No medicine was taken at the time of the examination. The blood of this patient was found to be rich in uric acid.

Case 2. W. B., a male patient, aged 46. The attack of gout commenced at night in the ball of the left great toe; the outer side of the ankle afterwards became affected, accompanied with much pitting on pressure; febrile disturbance slight.

Feb. 20, 1853.—Urine of 24 hours, 42 fl. ounces; sp. gr. 1012·5. Acid. No deposit of urate.

Uric acid passed during the whole day = 0·84 grains.

Feb. 21.—Urine of 24 hours, 46 fl. ounces; sp. gr. 1015. Acid.

Uric acid of whole day = 1·84 grains.

Feb. 22.—Urine of 24 hours, 63 fl. ounces; sp. gr. 1012. Acid.

Uric acid of whole day = 2·52 grains.

After this time the patient took colchicum for a day or two, which produced purging; the medicine, however, had been discontinued before the next examinations of the urine were made.

Feb. 26.—Urine of 24 hours, 18 fl. ounces ; sp. gr. 1023. Acid.
Uric acid of whole day = 2·30 grains.
Feb. 27.—Urine of 24 hours, 36 fl. ounces ; sp. gr. 1015. Acid.
Uric acid of whole day = 2·76 grains.

From Feb. 20 to Feb. 22 the gouty symptoms gradually subsided ; and after the latter date, little else remained than tenderness of the parts previously inflamed.

The blood of this patient was shown by analysis to contain much uric acid.

Case 3. J. C., a male patient, aged 57, suffering from acute gout in the ball of both great toes, and in several other joints both of the upper and lower extremities. A few nodules of urate of soda found in the ears, but in no other parts of the body.

May 2, 1856.—Urine, 24 fl. ounces ; sp. gr. 1024, at 60° Fahr. Turbid from urates, but clearing with moderate heat ; it contains a distinct trace of albumen.
Uric acid in the 24 hours = 3·76 grains.
Urea, ditto = 320 grains.

The blood of this patient contained much uric acid.

Case 4. J. P., a male patient, aged 46. Has had several attacks of gout during the last ten years ; no apparent alteration of any joint produced by the disease ; but in one ear a single spot of urate of soda is seen upon the helix. When the urine was analysed the patient was suffering from slight but increasing gouty inflammation, affecting both the ankles and right elbow. During the first three days that the examinations of the urine were made, no medicine was taken ; on the fourth, colchicum was administered, and continued during the fifth and sixth days ; under the influence of this drug the inflammation of the joints rapidly subsided.

Feb. 15.—Quantity, 58 fl. ounces; sp. gr. 1020.
Uric acid in 24 hours = 8·12 grains.
Feb. 16.—Quantity, 58 fl. ounces; sp. gr. 1020.
Uric acid in 24 hours = 8·12 grains.
Feb. 17.—Quantity, 43 fl. ounces; sp. gr. 1020.
Uric acid in 24 hours = 3·44 grains.
Feb. 18.—Quantity, 50 fl. ounces; sp. gr. 1020.
Uric acid in 24 hours = 4·00 grains.
Feb. 19.—Quantity, 59 fl. ounces; sp. gr. 1020.
Uric acid in 24 hours = 2·95 grains.
Feb. 20.—Quantity, 42 fl. ounces; sp. gr. 1020.
Uric acid in 24 hours = 0·17 grain.

No albumen could be detected in the urine, which was acid in reaction.

The blood was found to be rich in uric acid.

Case 5. T. D. M., a male patient, aged 50 years, for more than twenty of which he has suffered from gout; several small deposits of urate of soda upon the ears (Plate 1, figure 2), and many of the articulations have chalk-like deposits around them. On the 8th of January, 1853, several joints were swollen and red from acute gouty inflammation, the note of the day being as follows: "Swelling, heat, redness and tenderness of the dorsum of right hand, also of both wrists; considerable pitting of the hand on pressure. Right knee swollen, red, and tender; left knee affected in a less degree; pulse 100, rather full and hard; skin hot and moist." On the 11th the gouty pains had almost subsided, and the joints somewhat moveable; pulse 72. Jan 15th, quite free from pain; pulse 64. Jan. 18th, cured.

On the 8th, twenty minims of colchicum wine were prescribed three times a day, with half a drachm of

magnesia and fifteen minims of tincture of opium; the opium was omitted on the 11th after the pain had subsided. The urine under date January 9th was passed between 10 A.M., January 8th, and 10 A.M., January 9th, and so on for the remaining days.

Date.	Quantity: fl. oz.	Sp. gravity, at 60°.	Reaction.	Appearance.	Uric acid in 24 hours: grains.
Jan. 9	10·5	1016·5	Acid.	Dark claret red. No deposit and no albumen.	0·5
,, 10	26	1014	,,	Ditto	1·7
,, 11	32	1013	,,	Lighter colour. Uric acid deposit.	5·3
,, 12	36	1013	,,	Clear yellow.	5·5
,, 13	28	1016	,,	Clear	5·5
,, 14	14	1016·5	,,	Ditto	4·0
,, 15	18	1019·5	,,	Ditto	3·3
,, 16	18	1019	,,	Ditto	3·6
,, 17	25	1016·5	,,	Ditto	3·4
,, 18	36	1015·5	,,	Ditto	2·9

At the commencement of another attack, the urine of the same patient was examined before the administration of medicine, with the following result:

Quantity, 17 fl. ounces; sp. gr. 1021. Acid.
Uric acid in 24 hours = 0·425 grain.

During acute attacks the urine of this patient always gave evidence of the presence of a small quantity of albumen, which could not be detected in the intervals.

The blood was examined at intervals during a period of some years, and yielded abundance of uric acid.

CASE 6. B. F., a male patient, aged 38, has suffered, during the last seven years, from five or six attacks of gout. No deformity of joints and no visible deposits

of urate of soda in any part. From the 16th to the 19th of January suffered considerably from inflammation of the left knee, both hands, and right great toe. The urine was uninfluenced by medicine when the examinations were made.

Jan. 15.—Urine, 25 fl. ounces; sp. gr. 1012, at 60° Fahr. Acid. No albumen.
Uric acid eliminated in the 24 hours = 1·30 grains.
January 16.—Urine, 30 fl. ounces; sp. gr. 1010. Acid.
Uric acid eliminated in the 24 hours = 1·95 grains.
January 17.—Urine, 26 fl. ounces; sp. gr. 1012. Acid.
Uric acid eliminated in the 24 hours = 2·73 grains.
January 18.—Urine, 39 fl. ounces; sp. gr. 1011. Acid.
Uric acid eliminated in the 24 hours = 2·14 grains.
January 19.—Urine, 47 fl. ounces; sp. gr. 1009. Acid.
Uric acid eliminated in the 24 hours = 3·05 grains.
The blood of this patient was rich in uric acid.

Case 7. W. F., a male patient, aged 41, has had several attacks of gout during the last ten years. Some small deposits of urate of soda are seen on the palmar surface of left index finger, but none on the cartilages of the ears. An acute attack is now passing off (March 27th).

March 27, 1858.—Urine, 24 fl. ounces; sp. gr. 1024. Acid in reaction. Of an amber colour, and depositing a yellow urate sediment on cooling.
Uric acid passed in 24 hours = 5·20 grains.
Urine crystallised freely with nitric acid from the large amount of urea.
April 8.—Has been free from all acute symptoms for some days. Urine, 48 fl. ounces sp. gr. 1017. Acid. Clear, no deposit.
Uric acid passed in the 24 hours = 1·36 grains.

From a review of the results of these cases it will

be observed that, as far as hospital patients are concerned, the daily excretion of uric acid during a fit of gout is not necessarily increased—nay, often notably diminished: taking the average normal excretion at 8 grains in the twenty-four hours, it will be seen that in the seven cases just detailed the highest amount reached was only 8·12 grains, the lowest 0·425 grain, and the averages of the seven cases, 5·95—2·05—2·58—3·76—4·46—3·28—3·28 grains, giving a total average derived from all the analyses 3·62 grains. Several of the urines were high coloured, some were turbid from urates, and in others there was a deposition of crystallised uric acid; in a few, the secretion was clear and free from all sediment.

The above results were, as I have before observed, obtained from hospital patients, and I have made no analyses myself, nor can I find any of other observers, showing accurately the daily elimination of uric acid in acute gout among members of the higher classes of society, although I have been frequently able to determine this point in the more chronic forms of the disease. I am convinced that the cause of the prevalent idea that there is always an excess of uric acid thrown out of the system by gouty individuals, especially in the acute forms of the disease, is derived from the fact that, when febrile disturbance runs high, the renal secretion usually becomes scanty, its acidity is increased, and therefore almost the whole of the uric acid is deposited and thus rendered visible to the eye; at the same time, the tendency of uric acid

to attract the colouring matters of the urine, adds greatly to this appearance of excess.

Having established the fact that patients suffering from acute gout do not excrete an excess of uric acid, but rather the reverse, it becomes an interesting question to ascertain whether this defect depends on any diminution in the formation of the acid in the economy, or on its imperfect excretion by the kidneys. This question is fortunately not difficult to determine, for in every instance above recorded the blood was examined, and proof afforded that in all there existed an abnormal quantity of uric acid in the serum, thus proving indubitably that the renal organs were unable to excrete the uric acid formed in the system, and, as the elimination of this acid was shown to be under the average, demonstration was afforded that the kidneys had lost, at least for the time, some of their usual excreting power. In many other diseases, as of the liver and spleen, although the production of uric acid may be greatly augmented, still, the kidneys retaining their eliminating power, the blood is kept free from this principle. The knowledge of these facts is of considerable importance, as it is frequently assumed that the appearance of a large quantity of uric acid in the urine indicates that the blood is contaminated with the same body, whereas on reflection it will be at once evident that such an occurrence favours the opposite view, for if the kidneys excrete freely, the blood has a much greater chance of being pure.

Another result obtained from the above analyses is the fact, that in acute gout the quantity of uric acid eliminated on different days is liable to much variation: in the early stages of an attack, the excretion of this acid is usually small, it then gradually augments, and when the fit is passing off again diminishes. In Case 4, the quantity was greatest during the first two days, but in this instance the analyses were not undertaken until the disease was abating.

My present experience on the subject shows, that in the earlier stages of acute gout the urine is scanty, and the uric acid, measured by the twenty-four hours' excretion, diminished; that the acid is thrown out in much larger quantities as the disease is passing off, and that then amounts even above the patient's daily average may be excreted, forming the so-called critical discharges; that after a time the uric acid is again lessened, although not to the extent observed prior to or at the commencement of an attack.

The daily amount of *urea* was estimated, in one of the above cases, and found to be 320 grains; a fair average for a patient on a low diet. The elimination of the urea in gout is not affected in the same ratio as the uric acid, although I have ascertained from repeated experiments, that the blood in the acute forms of the disease usually contains a small amount of the former principle.

Sometimes a very distinct trace of *albumen* is present in the urine in acute gout; this occurred in

two of the Cases above quoted; the phenomenon is not, I believe, at all common in the early attacks, but as the disease assumes a chronic condition, and especially when deposits of urate of soda are seen, then traces of albumen are frequently observed during the fit, although in the intervals not the slightest evidence of this body can be obtained.

CLASS II.—*Urine of subjects affected with Chronic Gout, the majority of them at the time the examinations were made having no very urgent symptoms, but suffering from the sequelæ of this disease, as shown by the presence of concretions of urate of soda in different parts of the body, and the stiffened and deformed condition of the joints.*

Case 1. J. H., a male subject, aged 45 years. Has had gout for fourteen years; small deposits of urate of soda present on the cartilages of the ears, but the joints not deformed. When the urine was examined, he was suffering in the feet and ankles, and also in the right knee. No medicine was administered at the time.

March 30, 1853.—Urine, 56 fl. ounces; sp. gr. 1011. Clear, yellow, not giving rise to any deposit; a slight trace of albumen present.
Uric acid in 24 hours = 5·78 grains.
The blood contained much uric acid.

Case 2. J. M., a gentleman, aged 85 years. Has suffered from gout for fifty years. Concretions of urate of soda extensively diffused over his body; gouty abscesses of fingers, discharging chalk-like matter.

June, 1856.—Urine passed at 3 P.M., sp. gr. 1017. Pale yellow; clear; gives evidence of a small amount of albumen.

With hydrochloric acid this urine only deposited a few crystals of uric acid, requiring the microscope to detect them.

The urine of the same patient passed during the night was pale, sp. gr. 1018. Acid, with distinct traces of albumen; and gave, when acidulated with hydrochloric acid, only a few microscopic crystals of uric acid.

Case 3. W. L., a gentleman, aged 61. Has suffered many years from gout, his hands and feet much deformed from the presence of extensive deposits of urate of soda.

May, 1857.—Urine, passed three or four hours after dinner, of a pale yellow colour; sp. gr. 1015. Acid in reaction; slightly, though decidedly, albuminous. When acidulated with hydrochloric acid, gave a few microscopic crystals of uric acid, not sufficient to collect and weigh.

Case 4. A male patient, aged 52. Has suffered from gout for many years; some deposits of urate of soda seen on both ears, but not elsewhere. No active gouty symptoms at the time of the urinary examination; urine always pale, and free from deposits.

October 22, 1849.—Urine, 72 fl. ounces; sp. gr. 1010.

October 27.—Urine, 56 fl. ounces; sp. gr. 1012, at 60° Fahr. Uric acid from 24 hours' urine = 0·38 grain.

November 4.—Urine, 52 fl. ounces; sp. gr. 1009, at 60° Fahr. Acid. Uric acid in 24 hours = 0·20 grain.

The blood was found to be rich in uric acid.

Case 5. R. H., a male subject, aged 41 years. Suffering from chronic gout of several years' standing; a few nodules of urate of soda seen upon the cartilages of the ears, and on the palmar surfaces of

one or two fingers, near the extremities. No active gouty symptoms present at the time the analyses were performed.

June, 1847.—Urine, 42 fl. ounces; sp. gr. 1015. Acid; pale in colour; very slightly albuminous.

Uric acid from the 24 hours' urine amounted to only a few microscopic crystals.

Many other examinations of this patient's urine were made within the course of the following month or six weeks with a like result.

It was in this patient's blood, at the time above referred to, that I first discovered the presence of uric acid; from it also I was enabled to crystallise urate of soda in the form shown, Plate 5, fig. 4.

Case 6. D. R., a male patient, aged 45 years; has suffered from gout for more than ten years; deposits of urate of soda observed on the ears, and some distortion of the hands.

Urine, 65 fl. ounces; sp. gr. 1014. Clear; acid.
No uric acid could be obtained from the entire 24 hours' urine.

Case 7. W. B., a male patient, aged 52. Has suffered from gout for many years, and is much deformed by extensive deposits of chalk-stones, the joints also much stiffened and distorted. Pain and tenderness of different joints almost always present, and likewise gouty abscesses discharging chalky matter. Many examinations of the urine made at different periods.

September, 1843.—Urine, 50 fl. ounces. Pale. Acid.
Uric acid obtained from the 24 hours' urine = 0·5 grain.

December 9.—Urine, 36 fl. ounces; sp. gr. 1014. Acid.
Uric acid in 24 hours amounted only to a few microscopic crystals.
December, 1849.—Urine, 60 fl. ounces.
Uric acid, from 24 hours' urine, not in sufficient quantity to weigh.
February, 1850.—Urine, 60 fl. ounces.
Uric acid, from 24 hours' urine, amounted only to a mere trace.
In all the examinations of this patient's urine, a distinct trace of albumen was detected.

Case 8. D. M., a female patient, aged 39. Of spare habit; although the first attack occurred three years since, she is already extremely deformed from large chalk-like deposits about the hands and feet; some of the joints more or less swollen and painful.

1848.—Urine, amount not ascertained; pale; acid; sp. gr. 1010; slightly albuminous. When treated with hydrochloric acid it yielded no trace of uric acid.

Case 9. W. M., a male patient, aged 52. Suffered many years from gout; at present has considerable stiffness of joints, and deposits of urate of soda upon the ears and elsewhere. No active symptoms present during the time of the urinary examinations.

March 29, 1853.—Urine, 35 fl. ounces; sp. gr. 1016. Clear, yellow; not giving rise to any deposit, but yielding distinct evidence of the presence of albumen.
Uric acid in 24 hours = 2·5 grains.
This patient's urine was examined on various occasions during the course of many years; it frequently gave but a mere trace of uric acid, but some albumen was always present. The blood was also analysed, and found charged with the uric acid.

Case 10. W. F., a male patient, aged 38. Has had several attacks of gout, at first implicating only

the ball of the great toe, but afterwards affecting the joints of both upper and lower extremities; a few spots of urate of soda seen on the palmar surfaces of the left index finger. No active symptoms present when the urine was submitted to examination, and no medicine taken at the time.

May 11, 1854.—Urine, 35·5 fl. ounces; sp. gr. 1024. Acid. No deposit. No albumen.
Uric acid in the 24 hours = 1·34 grain.
Urea, ditto = 306 grains.
May 12.—Urine, 32 fl. ounces. Acid.
Uric acid in the 24 hours = 0·76 grain.
Urea, ditto = 333 grains.
May 13.—Urine, 30 fl. ounces; sp. gr. 1025.
Uric acid in the 24 hours too small in quantity to weigh.
Urea, in the 24 hours = 344 grains.
May 15.—Urine, 39·5 fl. ounces; sp. gr. 1018. Acid.
Uric acid in the 24 hours, a trace only.
Urea, ditto = 358 grains.
Blood found to contain much uric acid.

Nearly four years after the above date, this patient's urine was again examined. At the time of the first analysis the gouty attack was passing off; when the second was made, he was quite free from active symptoms.

March 28, 1858.—Urine, 24 fl. ounces; sp. gr. 1024. Acid. Of an amber colour, and depositing yellow urates on cooling.
Uric acid passed in the 24 hours = 5·20 grains.
April 8.—Urine, 48 fl. ounces; sp. gr. 1017; and giving rise to no deposit.
Uric acid passed in the 24 hours = 1·36 grain.

Case 11. C. F., a male subject, aged 38. Has suffered from numerous attacks of gout for ten years;

the first few were confined to the feet; at present he has small concretions of soda in the left ear, and also a semi-fluid collection of the same matter at the side of the left foot; some deposits also on the right little finger.

The urine was first examined for fourteen successive days, in January, 1854, the patient's symptoms at the time being very chronic, and the results were as follow:

Date.	Quantity, Fluid oz.	Sp. gr.	Reaction.	Physical Appearance.	Uric acid passed in 24 hours: grains.
Jan. 4	57	1012	Acid.	Clear.	0·50
,, 5	44	1013	,,	,,	0·05
,, 6	44	1013	,,	,,	0·00
,, 7	37	1012	,,	,,	0·14
,, 8	46	1011	,,	,,	0·00
,, 9	44	1011	,,	,,	0·00
,, 10	44	1012	,,	,,	0·71
,, 11	34	1014	,,	,,	0·09
,, 12	61	1013	,,	,,	2·40
,, 13	55	1012	,,	,,	0·00
,, 14	87	1009	,,	,,	0·00
,, 15	81	1011	,,	,,	0·00
,, 16	73	1015	,,	,,	0·00
,, 17	84	1014	,,	,,	0·00

The experiments were again repeated in February.

Feb. 18.—Urine, 57 fl. ounces; sp. gr. 1012·5, at 60° Fahr. Acid. No albumen.

Uric acid eliminated in 24 hours = 1·22 grain.
Urea, ditto = 411 grains.

Feb. 19.—Urine, 51 fl. ounces; sp. gr. 1014, at 60° Fahr.

Uric acid eliminated in 24 hours = 0·71 grain.
Urea, ditto = 392 grains.

February 20.—Urine, 74 fl. ounces; sp. gr. 1010, at 60° Fahr.

Uric acid eliminated in 24 hours = 0·69 grain.
Urea, ditto = 356 grains.

February 21.—Urine, 50 fl. ounces; sp. gr. 1015, at 60° Fahr.
Uric acid eliminated in 24 hours = 3·65 grains.
Urea, ditto = 384 grains.

The blood of this patient was found to contain much uric acid.

The urine was once examined when this patient was under the influence of colchicum.

January 26.—Urine, 38 fl. ounces; sp. gr. 1017, at 60° Fahr.
Uric acid eliminated in 24 hours—no trace.
Urea, ditto = 288 grains.

Case 12. C. F., a male subject, aged 35. Has had a few attacks of gout; some slight, but the last very severe, induced by a serious accident. Small concretions of urate of soda noticed in the ears, and around some of the joints of the fingers. No acute symptoms present when the examinations of the urine were made.

Jan. 21,	urine	57	fl. oz.;	sp. gr.	1012	at 60°	Fahr.	None of the specimens gave any deposit of uric acid when acidulated with hydrochloric acid, and allowed to stand 48 hours.
,, 22	,,	51	,,	,,	1013	,,	,,	
,, 23	,,	59	,,	,,	1014	,,	,,	
,, 24	,,	59	,,	,,	1013·5	,,	,,	

The blood contained much uric acid.

Case 13. J. P., a male patient, aged 43. For eleven years he has been subject to frequent attacks of gout, at first confined to one great toe and ankle; two small deposits of urate of soda seen on the cartilages of ears. No active symptoms present when the urine was examined.

Jan. 24, 1854, urine 70 fl. ozs.; sp. gr. 1012·
,, 30, ,, ,, 52 ,, ,, 1011·
,, 31, ,, ,, 58 ,, ,, 1011·

The three specimens acidulated with hydrochloric acid gave mere traces of uric acid.

The blood at this time was rich in uric acid.

After two years' interval the same patient's urine was again examined on recovery from a slight attack of gout, and when no active symptoms were present and no medicines administered. The examinations were made chiefly to ascertain the amount of urea eliminated.

February	23,	1856.	Urea, in the 24 hours	= 286 grains.
,,	24,	,,	,, ,,	= 213 ,,
,,	25,	,,	,, ,,	= 304 ,,
,,	26,	,,	,, ,,	= 299 ,,
,,	27,	,,	,, ,,	= 359 ,,
,,	28,	,,	,, ,,	= 315 ,,
,,	29,	,,	,, ,,	= 302 ,,
March	2,	,,	,, ,,	= 312 ,,
,,	3,	,,	,, ,,	= 264 ,,
,,	5,	,,	,, ,,	= 262 ,,
,,	6,	,,	,, ,,	= 234 ,,
,,	7,	,,	,, ,,	= 287 ,,

On several of the above days the urine was treated with hydrochloric acid, in order to ascertain the amount of uric acid, but on no occasion was sufficient quantity precipitated to collect and weigh; in fact, only few microscopic crystals could be detected. The blood at the same time contained a large amount of uric acid.

Case 15. T. C., a male subject, aged 57. Gout of about twelve years' standing; very large concretions observed upon the cartilages of the ears and in other parts of the body.

September, 1854.—Urine pale, of low specific gravity, with a trace of albumen; when acidulated with hydrochloric acid, gave a mere
[illegible]ric acid.
[illegible]uch uric acid.

Case 16. R. W., a male patient, aged 53. Had suffered from gout for fourteen years, the first and two subsequent attacks were confined to the ball of left great toe; other joints afterwards became affected. Has noticed deposits in ears for at least seven years, which are now very large, and numerous spots of urate of soda are also seen on left lower eyelid; considerable chalk-like masses exist about the hands and elbows, which are thereby much deformed and crippled.

June, 1858.—Urine passed at 12 at noon, sp. gr. 1011; distinctly albuminous. Treated with hydrochloric acid, gave no trace of uric acid.

Case 17. T. F., a gentleman, aged 64. Has had gout for twenty years. At first confined to the ball of one or other great toe, but in course of years gradually travelling upwards. Is now suffering from chronic pains, and has some enlargement about the fingers; one of these, on being punctured, gave exit to a creamy fluid, consisting of crystallised urate of soda. No deposit upon the cartilages of ears.

Urine, 80 fl. ounces; pale yellow; sp. gr. 1013.

No trace of uric acid when acidulated with hydrochloric acid.

On another occasion, the urine of this patient gave a moderate deposit of uric acid when treated in the same manner.

A glance at the foregoing analyses will at once show that there is a marked diminution of the uric acid in the urine of patients suffering from chronic gout; in no case did it exceed 5·78 grains, and this

on one day only; the next highest number representing the elimination of uric acid is 3·57 grains, and even such appeared to be on a very exceptional day, the excretion of this principle being usually much smaller; the total average of all the analyses in this second class of cases is exceedingly low, far under a single grain. Several urea determinations of these urines were likewise made; four in Case 10, where the quantities were found to be 306 grains, 333 grains, 344 grains, and 358 grains, giving an average of 335 grains for the daily elimination of this body; and it will be noticed, on looking over the details of the analyses, that, although the quantity of urea remains nearly constant and about normal in quantity, the uric acid is not only exceedingly deficient in amount, but subject to the greatest fluctuations, varying in the four days from 1·34 grains to a quantity too small to be collected and weighed. Again, in Case 11, four determinations of the urea give 385 grains as the daily average, with but a slight difference between the mean and extremes, the uric acid during the same period exhibiting the same violent variations as in Case 10; namely, from 3·65 grains to 0·71 grain, and on another occasion from 2·4 grains to 0·0 grain. In Case 14, the urea was determined, with one exception, on twelve successive days: the average was found to be 286 grains, the extremes being 213 grains and 359 grains. On several of the above occasions an attempt was made to estimate the uric acid, but in no analysis was a quantity found sufficiently large to

collect and weigh. From these observations it is evident, that in cases of chronic gout the function of the kidneys for excreting urea from the blood may remain intact, at the same time that the power of eliminating uric acid may be seriously impaired.

Another point of interest shown by these examinations is the fact of the frequent presence of a small amount of albumen in the urine of chronic gout. In ten out of the seventeen cases it is stated to be present, and it is possible that in some of the remaining seven it might have existed, as its absence is not always specially asserted. The quantity of albumen is not usually large, but sufficient to give a distinct haziness, when the urine is boiled with the addition of nitric acid, and also a notable precipitate after the tube is allowed to remain at rest for a short time.

In conclusion, it may be stated that the more common appearances and characters of the urine in chronic gout, as shown by these and other examinations, are as follows:—

It is rather paler than healthy urine, of lower density, and increased in quantity.

The amount of urea, except in extreme cases, remains much as in health (due regard being taken of the diet of the patient at the time).

The uric acid is very much diminished, and liable to be excreted in an intermittent manner. A small amount of albumen is frequently present.

The occurrence of deposits in the urine is not common; they occasionally occur during the cooling of

the fluid, either in the form of urate of soda, or as rhombs of uric acid, more or less coloured.

CLASS III.—*Urine of individuals suffering occasionally from attacks of Gout; examined at the time of complete freedom from symptoms.*

Case 1.—The first three analyses were of the urine of a gentleman, 40 years of age, rather tall and stout, subject to occasional attacks of gout in the ball of the great toe, but having never had any other joint affected; health otherwise good.

January 16, 1852.—Urine, 41·5 fl. ounces; clear, amber colour; acid; sp. gr. 1024, at 60° Fahr. Contains no albumen, and gives rise to no deposit on cooling.

Uric acid eliminated in the 24 hours = 4·72 grains.

January 17.—Urine, 43 fl. ounces; sp. gr. 1022. Acid. Gives rise to a light pinkish coloured deposit of urates on cooling.

Uric acid eliminated in the 24 hours = 6·50 grains.

January 21.—Urine, 47 fl. ounces; sp. gr. 1023. Clear, amber coloured. No deposit on cooling.

Uric acid eliminated in the 24 hours = 3·85 grains.

Case 2.—A gentleman, aged 56. Has suffered from gout for many years, and has had the larger joints of the body affected as well as the great toe.

February 12, 1851.—Urine, 60 fl. ounces; sp. gr. 1014, at 60° Fahr. Free from albumen.

Uric acid eliminated in the 24 hours = 4·26 grains.

A small blister applied at another period yielded a fluid which contained a considerable amount of uric acid.

Case 3.—M. C., a lady, about 38 years of age, who had suffered from atonic gout for many years, but is

free from any external deposits of urate of soda, and from deformity or stiffness of joints.

Urine, 42 fl. ounces; pale in colour; no albumen; sp. gr. 1019, at 60° Fahr.
Urea eliminated in the 24 hours = 373 grains.
Uric acid, ditto, no trace deposited.

Case 4.—J. L. R., a male subject, aged 48. Has suffered from three attacks of gout, the great toe being especially affected in each attack. No deposit of urate of soda visible either upon the cartilages of the ears or any other part of the body.

February 21, 1854.—Urine, 58 fl. ounces; sp. gr. 1015, at 60° Fahr.
Uric acid eliminated in the 24 hours = 2·93 grains.
February 23.—Urine, 88 fl. ounces; sp. gr. 1080, at 60° Fahr.
Uric acid eliminated in the 24 hours = 1·23 grain.
Urea, ditto, = 385 grains.
February 24.—Urine, 60 fl. ounces; sp. gr. 1014, at 60° Fahr.
Uric acid eliminated in the 24 hours = 1·82 grain.
Urea, ditto, = 335 grains.
February 25.—Urine, 77 fl. ounces; sp. gr. 1011, at 60° Fahr.
Uric acid eliminated in the 24 hours = 1·69 grain.
Urea, ditto, = 370 grains.
February 27.—Urine, 64 fl. ounces; sp. gr. 1013, at 60° Fahr.
Uric acid eliminated in the 24 hours = 0·19 grain.
Urea, ditto, = 338 grains.
The blood taken during the fit was found rich in uric acid.

At the time this patient's urine was examined for urea and uric acid, it was clear and free from deposits, but during the attack, which was very severe, the urine became turbid on cooling from the deposition of red urates; no albumen was present at any period.

Case 5.—T. B., a male patient, aged 54, had suffered from numerous attacks of gout, chiefly in the

great toe; no deposits of urate of soda visible in any part. He was free from all symptoms, and had omitted medicines for some time before the examinations of the urine were made, but a few days afterwards he had a return of gout. The patient was allowed a moderate amount of meat.

May 11, 1854.—Urine, 60 fl. ounces; clear; acid; sp. gr. 1019.
Uric acid eliminated in the 24 hours,—a mere trace.
Urea, ditto, =372 grains.
May 12.—Urine, 54 fl. ounces; acid; sp. gr. 1017.
Uric acid eliminated in the 24 hours,—too small to collect and weigh.
Urea, ditto, =441 grains.
May 13.—Urine, 74 fl. ounces; sp. gr. 1015.
Uric acid eliminated in the 24 hours,—a mere trace.
Urea, ditto, =569 grains.
The serum of the blood examined during the attack was found to be rich in uric acid.

Case 6.—S. N., a male subject, aged 68. Had suffered for many years from repeated attacks of gout, chiefly in the great toes, but other joints have occasionally been affected.

February 21, 1854.—Urine, 55 fl. ounces; sp. gr. 1013.
Uric acid eliminated in the 24 hours=1·93 grain.
Urea, ditto, =317 grains.
February 22.—Urine, 50 fl. ounces; sp. gr. 1014.
Uric acid eliminated in the 24 hours=2·28 grains.
Urea. ditto, =312 grains.
February 23.—Urine, 44 fl. ounces; sp. gr. 1014.
Uric acid eliminated in the 24 hours=1·60 grain.
Urea, ditto, =275 grains.
February 24.—Urine, 29 fl. ounces; sp. gr. 1016.
Uric acid eliminated in the 24 hours=1·48 grain.
Urea, ditto, =234 grains.

February 25.—Urine, 40 fl. ounces; sp. gr. 1014.
Uric acid eliminated in the 24 hours = 2·72 grains.
Urea, ditto, = 269 grains.

This patient had taken small doses of the acetic extract of colchicum in the form of pill for several days previous to the 21st, and on the 22nd was ordered to omit the drug, on account of the occurrence of slight diarrhœa; this continued more or less till the 25th. From his own statement there was no loss of urine during that time.

It will be seen from the above cases that in no one of the six patients did the amount of uric acid excreted in the twenty-four hours exceed the healthy average; in the majority it was far below. From these and other less complete examinations I am inclined to think that in individuals who have suffered frequently from gout, even though no visible deformity of the joints or deposits may have resulted therefrom, the kidneys lose to some extent their power of excreting uric acid; moreover, I am convinced from the results of many trials, that the blood is often kept impure from its presence. This is probably one cause of the extreme liability of such patients to periodic visitations of the malady, and also of the great difficulty in effecting its radical cure.

It is likewise interesting to observe that in these individuals, as well as in those suffering from acute or chronic gout, the urea-eliminating function of the kidneys remains comparatively intact.

Microscopic examination of the Urine in Gout.—The urine of gouty patients sometimes exhibits microscopic characters of great value in arriving at a correct prognosis of the disease. In the early stages of gout occurring in individuals otherwise healthy, the information obtainable from microscopic examination of this fluid is of little moment. The urine, perhaps, exhibits a deposit of urate of soda, varying in hue from a pale buff to a bright pink, or brick-dust red, and consisting either of amorphous granules, or masses, or groups of spiculæ; or there may be sediments of uric acid; or the two may be combined, as seen in Plate 6, fig 1, and fig 2, *a*, *b*; but as these are frequently noticed in other diseased conditions of the system, the information they afford is slight. When, however, the affection becomes chronic, and more especially when extensive deposits are forming around the joints, then other phenomena are frequently observed. Along with the small amount of albumen which we have found to be so common, casts of tubes are met with, generally of a granular character, as exhibited in Plate 6, fig. 6 *a*, and consisting of disintegrated epithelium, more or less moulded into the shape of the tubes. Sometimes these are seen during the acute exacerbation, but not in the intervals; such was the case with the urine of two patients recently under my care. This appearance of granular casts, indicates that a desquamative process is going on from the lining membrane of the uriniferous tubes, a change closely connected with deficient secretion of some of the

elements of the urine, and more especially of the uric acid.

When the disease is still further advanced, a condition commonly evidenced, not only by the fearfully crippled state of the patient from deposits, but likewise by the occurrence of other more serious symptoms, as epilepsy, paralysis, and coma, due to imperfect elimination from the kidneys, then not only does the urine become permanently, though perhaps slightly albuminous, but the granular casts are more or less replaced by others of a waxy or fibrinous nature; these latter forms are seen in fig. 13, mixed with some of the granular variety.

Fig. 13.*

Several of the cases illustrative of chronic desquamative nephritis, related by Dr. G. Johnson, were the subjects of chronic gout.

In the latter stages of gout, copious deposits of uric acid, or urates, are not often met with, and the urine becoming much brighter and more natural in appearance, usually impresses the patient with the idea that an improvement in his state of health has commenced, whereas, in fact, it is an indication that the

* Fig. 13. Casts of tubes, some granular, some waxy or fibrinous in character, drawn from a specimen kindly lent by Dr. G. Johnson. Linear magnifying power, 220.

excreting power of the kidneys has become deficient, at least for uric acid.

We have already alluded to the intermittent manner in which the uric acid is sometimes eliminated in gouty cases. For days, scarcely a trace may be thrown out, and then suddenly such an amount as to be rapidly deposited in a crystalline form, when the urine is allowed to cool. Lastly, oxalate of lime is of frequent occurrence in the urine of gouty patients, but as it is found in so many other diseases, its presence is of no value as a diagnostic mark. More commonly it is found in octahedra, rarely as dodecahedra, and occasionally in the dumb-bell variety, as shown in Plate 6, fig. 3, *a*, *b*, *c*.

March, 1862.—Want of time has prevented me from making many further quantitative analyses of the urine in gout, since the publication of the first edition of the present work, but abundant opportunities have been afforded me of testing the accuracy of most of my former statements, more especially in cases occurring in the higher ranks of life. I can positively affirm that the presence of a slight amount of albumen is very common in the chronic form of the disease; in acute gout it is less frequent, and often disappears after the paroxysm has subsided; but in the chronic variety, it is usually permanent, although it may vary much in amount. Experience has convinced me of the great importance of attending to this state of the urine in reference to the treatment of the disorder. I am no less convinced of the truth of my

statement as to the deficiency of uric acid in gouty urine, and that the defective elimination generally bears a close relation to the inveterate character of the malady.

CHAPTER VI.

THE MORBID ANATOMY OF GOUT:—GREAT IMPORTANCE OF THE SUBJECT—CHANGES IN THE JOINTS OBSERVED BY PORTAL, MORGAGNI, DR. MONRO, AND OTHERS—SIR B. BRODIE'S DISSECTION OF A GOUTY SUBJECT—CRUVEILHIER'S OBSERVATIONS—THE AUTHOR'S INVESTIGATIONS—1. CASES OF CHRONIC GOUT WITH EXTENSIVE CHALK STONES AND DISTORTIONS—2. SUBJECTS EXHIBITING POINTS OF DEPOSITION ON THE EARS ALONE—3. CASES IN WHICH NO DEPOSIT OR DEFORMITY EXISTED—4. WHEN ONLY THE BALL OF ONE GREAT TOE HAD BEEN AFFECTED WITH GOUT—5. WHEN A SINGLE ATTACK OF GOUT HAD OCCURRED MANY YEARS PREVIOUSLY.

IT is commonly remarked, in works devoted to the consideration of gout, that morbid anatomy has effected little towards the elucidation of the nature of the disease; that although alterations of structure have been found in many cases, still these have been insufficient and too much wanting in constancy and precision to be depended on. I hope, however, to be able to show that at the present time this remark is no longer correct, and that the study of those changes, which I shall demonstrate to be constant in all cases of the disease, throws considerable light upon the true nature of gout. Considering this part of the subject of the highest importance, I shall not hesitate to devote considerable space to its investigation, and shall endeavour to present to the reader all that is important concerning it,

some portion of which has only been satisfactorily proved within a very recent period—I allude especially to the early changes of structure in the joints, and to the frequent or almost constant affection of the kidneys.

It has been long known that changes in and around the joints occasionally ensue in gout, arising from the deposition of a chalk-like matter, principally composed of urate of soda, but this phenomenon has generally been looked upon as rather exceptional, and as occurring only in individuals who have suffered from the disease in its most inveterate and protracted forms, and no idea was entertained that any necessary relation existed between gouty inflammation and such deposition.

M. Portal, in his "Anatomie Médicale," assures us he has seen the synovial secretion of the consistence of jelly, or even sometimes so thick as to have the appearance of plaster; he also observed, after prolonged and severe gout, the bones of the feet covered with this white matter. Morgagni relates the same in his account of the examination of the joints of a Venetian nobleman.

Dr. Monro, jun., in his "Outlines of Anatomy," remarks, "The extremities of the bones of the feet and hands have been said to be occasionally converted into a white substance like chalk in persons who have been long afflicted with gout," and in the first volume of the Medical Communications, 1782, Mr. Henry Watson relates the appearances found in the body of

an extremely gouty subject and well known character, a Mr. Middleton; the most important points of his examination are as follows:—One of the great toes was much enlarged, and on dissection the ball or first joint was found, as if encased in a bed of chalk, like a fossil shell, but the bone itself was neither increased in size nor altered in structure. The joints of the fingers were also swollen and knotty, each knot being a lump of chalk, and, when he played at cards, he used frequently to score up the game with his knuckles. On the middle of the right tibia there appeared an oblong tumour resembling a node, over which the integuments were very thin and ready to burst; it was a mere deposition of chalk between the skin and periosteum, and though thick and large, had not as yet done any injury to the bone.

Mr. Middleton had complained of excruciating pains in his head, often imagining he was tumbling headlong; this was especially the case a little before his death. The dura mater was found indurated, the substance of the brain firm, with a clear fluid in the ventricles; the pia mater was pale, and on its outer surface was a cream or smooth chalk-like mucus. The heart was healthy, and also the thoracic aorta; the aorta, however, was ossified from the diaphragm to the iliac arteries. The kidneys were much diminished in size, and contained hydatids, and the outer surface of the right was studded with little bladders. No calculi or chalk were observed in the kidneys or urinary bladder.

The synovial fluid in the joints of the lower extremities was as thick as cream, like a mixture of chalk, oil, and water, but the cartilages were not much altered.

In the lobe of one lung a small stone was discovered, and the tracheal glands were filled with white matter.

It must be borne in mind that Mr. Watson was not at all aware of the nature of the chalky substance above spoken of, and had no power of chemically distinguishing deposits of urate of soda from those of carbonate and phosphate of lime, and therefore we have no proof that the white matter in the bronchial glands and the small stone in the lung contained uric acid, or were in any degree related to the deposits in and around the joints, or had any connection with the gouty disease.

Sir B. Brodie, in 1812, made a dissection of an old lady who had suffered in an unusual degree from gout for a great part of her life, and the principal points of interest, in connection with the present subject, are given below. Several joints of the fingers were anchylosed, the fingers themselves being variously distorted; the middle finger of the left hand was shortened, and the skin over it loose. The bone of the second phalanx appeared to have been nearly absorbed, so that scarcely any of it remained, and only a small quantity of a soft substance occupied its place. The right wrist and elbow were anchylosed, as were also several joints of the toes. The knees

admitted of incomplete flexion and extension; and the motion of the joints was attended with a grating sensation. In various parts of the body there were orifices in the skin communicating with membranous cysts, situated in the adipose substance, and discharging a chalky liquid. There were no remains of the cartilages in the left knee. The corresponding parts of the patella and condyles of the femur had the appearance of having been worn into grooves and ridges, as if from friction on each other; presenting, however, a compact surface, the cancellous structure not being exposed, as would have been the case if friction had been carried to the same extent in the dead body. A thin layer of white chalk-like matter had been deposited on the bones in several places where the cartilages had disappeared. On the margin of the articulating surfaces were several small exostoses. The ligaments and synovial membrane were little altered from their natural state, with this exception, that the thin layer of the latter, which is extended over the cartilages, had disappeared with the cartilages themselves. In the right wrist the first row of the carpal bones were anchylosed to each other and to the radius. The other joints were not examined.

Cruveilhier, in his "Anatomie Pathologique," has given a plate delineating some of the appearances observed in the joints of a patient suffering from chronic gout. In the knee-joint the condyles of the femur were seen to be covered with the plaster-like substance, stated to penetrate to the bone, and the same

matter was also noticed on the synovial fringes. The articulating surface of the patella had the like deposits arranged more or less linearly; on its anterior surface two sub-cutaneous synovial capsules were found, the walls of which were thick and cartilaginous and sprinkled throughout with white points, and the contained liquid had the appearance of chalk and water; the fibrous layer covering the patella, as also the various tendons, were similarly affected.

In the ankle joint a like incrustation was observed, and deposits were found in the two lateral and posterior ligaments; the lateral and superior surfaces of the astragalus were also covered with the white matter.

On making a section of the astragalus, Cruveilhier observed within the substance of the bone, and at a small distance from the cartilage, little cretaceous masses, which he had also noticed near the calcanean surface of the bone, the neighbouring cartilage being in a perfectly healthy condition; the so-called cretaceous matter was evidently supposed by Cruveilhier to be of the same nature as the substance on the cartilages themselves. Small masses of deposit were likewise seen in the adipose cellular tissue, which covers the plantar and lateral faces of the os calcis, and also in the tendo Achillis. In the foot some of the articulations, as the astragalo-scaphoidean, calcaneo-cuboidean, and astragalo-calcanean, were nearly free from deposit, but those of the scaphoid bone, with the three cuneiform and cuboid bones, and the cuneiform bones among themselves were incrusted, as likewise

the metatarso-tarsal articulations, and the metatarso-phalangeal joint, or ball of the great toe. Linear deposits of chalky matter were seen on the periosteum, around the metatarsal bone and phalanges, the phalangeal articulation was anchylosed, and the cartilages apparently destroyed from deposition. The tendon of the flexor longus pollicis was covered with the concretion on both surfaces, as also were the ligaments surrounding the great toe.

The thumbs and little fingers were similarly affected, but the intermediate fingers very slightly so; the subcutaneous capsule of the elbow contained a plaster-like matter, the joint itself being healthy, but in the cellular tissue, along the course of the biceps, and even within some of the muscles, granular chalky concretions were found.

The results arrived at from the above examinations, may be thus summed up. In many cases of severe and protracted gout, deposits of chalky matter (urate of soda) occur around and within the joints, and upon the surface of their fibrous tissues; the synovial fluid becomes thick, now and then even of the consistence of plaster; the joints are either partially or completely anchylosed by the rigidity of the surrounding ligaments, and some of the smaller ones, especially the great toe, occasionally so completely surrounded with deposits as to exhibit the appearance of being inclosed in a chalky case.

The dissections hitherto given have been confined to gouty subjects who had suffered from the disease in

its most severe and protracted forms; from these alone we should be quite unable to arrive at any definite conclusion as to the occurrence of any constant changes during gouty inflammation. Considering this a most important point to determine accurately, I have for a long time devoted much attention to its consideration, and have recently been enabled to elucidate satisfactorily the real nature of these alterations.

In order to render the subject as clear as possible I will shortly lay before the reader the results derived from many autopsies of gouty subjects, some of whom have died during the presence of gouty inflammation, most however in the intervals, from accidents or maladies totally independent of gout; in commenting upon these I shall first describe the alterations seen in and around the articulations, and afterwards treat of the changes in other structures.

I.—*Examination of subjects of Chronic Gout, with extensive chalk-stones.*

Case 1.—1855. W. M., a man 55 years of age, a compositor by trade, not known to have any hereditary predisposition to gout, but a brother had suffered from the disease; he had formerly indulged in malt liquors and spirits, and altogether lived rather freely. About fifteen years before his death had the first attack of gout confined to the ball of the great toe; after a time, the disease became more general, gradually creeping upwards until nearly all the joints of the body had become implicated; deposits of urate of soda

had been observed for many years upon the cartilages of the ears, and around many of the smaller joints, especially of the hands, some of which had approached the surface and had been discharged by ulceration. Many of the articulations were anchylosed and otherwise deformed, and some of the bursæ, especially that over the left olecranon process, were much distended from deposition of chalky matter, the elbow however was less swollen than that represented in Plate 2. Albumen had been detected in his urine for some considerable time, with casts, and of late the renal affection had much increased and had been accompanied with some œdema of the lower extremities. The cause of his death appeared to have been exhaustion from the almost constant presence of gout in one or more joints, hastened by a severe shock to his nervous system.

On opening the left knee-joint, the synovial fluid was found thickened, and on close examination exhibited minute white specks of urate of soda. (Plate 5, fig. 3.) The condyles of the femur were extensively covered with the deposit, not simply arranged in streaks, but occupying a large amount of their surfaces, except at the outer margin, in the situation of the synovial fringes; the end of the tibia was coated, but less freely than the femur; the articulating surface of the patella was likewise incrusted.

The appearance presented when the joint was first examined, is accurately depicted in Plate 3, fig. 1, *a*, *b*, *c*, a drawing taken from a wax model made at the

time. The synovial membrane was very vascular, and numerous white granules could be observed and felt upon the surface, consisting also of urate of soda; deposits were likewise found on the crucial ligaments and fibro-cartilages. The right knee exhibited in every respect the same peculiarities as the left; all the articulating surfaces being freely covered with deposit, as well as the fibro-cartilages and ligaments, and the same changes were observed in the synovial membrane and fluid.

Many other joints were partially examined, as the elbow-joints, also several of the carpal and metacarpal, tarsal and metatarsal, and phalangeal articulations; for the most part the surfaces were covered with a white coating of urate of soda. The ball of each great toe was completely incrusted.

The kidneys weighed respectively 2¾ and 3 ounces avoirdupois; were pale and contracted; the cortical portion shrivelled, points and streaks of white matter were seen at the apex of each pyramid and running up in the direction of the tubuli.

The appearances exhibited by the right kidney, both externally and after section, are shown in Plate 4, fig. 2, *a*, *b*.

Case 2.—J. P., about sixty years of age, a strong-looking man, six feet in height, had been a gouty patient for many years, with deposits upon the cartilages of the ears and around many of the joints, some of considerable size. Death was occasioned by an accident.

Many of the joints were coated with white matter as in the previous case. The kidneys were much contracted, each weighing less than three ounces, and exhibiting the deposition of urate of soda upon the end of each cone, and also in the direction of the tubuli.

Case 3.—D. B., aged 54, not inheriting gout, a man of steady habits, who had rarely been intoxicated, but had been much exposed to cold and wet. He was first attacked with gout when 28 years old, in the ball of the left great toe, and has had numerous attacks since that time gradually increasing in severity: the disease was confined for some years to the lower extremities, but subsequently the fingers, hands, and elbows became affected; he first noticed the formation of chalk-stones eight years ago, after an injury to the back of his hand. At present (July, 1861) both ears are studded with deposits, the wrists enlarged and partially anchylosed, the feet and knees swollen and distorted, the latter flexed and almost immoveable; numerous sores exist about the diseased joints and give rise to a discharge of pus mixed with urate of soda.

This patient died worn out with suffering and exhausted by diarrhœa and gastric disturbance.

The articular surfaces of nearly all the joints were covered with a coating of chalky deposit, and the various ligaments freely sprinkled with it. In addition to the parts more usually found affected, it was noted, on examination of the left hip joint, that the cartilages of the head of the femur and of the cotyloid cavity

were also thickly spread over with the same plaster-like matter, and spots of urate of soda, as delineated in Fig. 14, were present in the ligamentum teres.

Fig. 14.*

A few minute specks of the same nature were likewise found on the arytenoid cartilage of the larynx; there was some atheromatous deposit about the mitral valve of the heart, but no uric acid was contained in it.

The capsules of the kidneys were adherent, the cortical structure diminished and not easily distinguished from the pyramidal portion; the substance was soft and fatty, some gritty collections were found in the pelvis of the left kidney, where there was also a small uric acid calculus, about the size of a pea.

* Fig. 14. The head of the femur of D. B., showing the deposition of urate of soda in the cartilage and spots of the same in the ligamentum teres.

Case 4.—H. B., aged 48, a musician, father and mother both subject to gout. For eleven years of his life took one pint of port wine daily, and frequently gin and water. First attack of gout twelve years ago in right great toe; second attack six months afterwards in both knees; in subsequent attacks which took place at uncertain intervals, the other great toe and both hands, wrists, knees and elbows were affected; there was much distortion of both hands, the fingers were twisted towards the ulna, nearly all the smaller joints enlarged, some producing a grating sensation on movement; no external deposits in ear or elsewhere.

Urine pale, containing a considerable quantity of albumen.

The patient sunk from an attack of pleuro-pneumonia. On examination, it was found that the metatarso-phalangeal articulations of both great toes were anchylosed, the ligaments around the joints infiltrated with urate of soda, and on forcibly separating the bones which were united by bony anchylosis, a considerable quantity of deposit was found at the original site of the joint, and in the periosteum around the bone. The first phalangeal joint of the right great toe exhibited only a few specks of deposit; on making a section of the metacarpal bone about one third of an inch from its extremity, it was found infiltrated with chalky material. The synovial fluid of the left knee-joint was transparent and had a well-marked acid re-action; the articulating surfaces were covered with a white layer

and the synovial membrane finely sprinkled; several of the other joints were similarly affected.

Both kidneys were small, the right weighed two and a half, the left three ounces and a quarter.

The capsules were very adherent, the surface very granular, the cortical substance much wasted, the pyramids reaching nearly to the surface, and numerous white streaks were observed in the direction of the pyramids.

There was some enlargement and fatty disease of the heart.

Case 5.—T. B., a man aged 50, not known to inherit gout. The first attack was 22 years ago, and he has had numerous and severe ones since; for the last four months has suffered much from œdema of the legs and scrotum; urine scanty and high coloured at times, occasionally very pale.

August, 1860, has had no acute attack of gout for eight months, at present both hands much crippled, many joints anchylosed, some are curved backwards, others are flexed. On nearly all the phalanges there are considerable deposits of urate of soda, some soft, others hard.

Both great toes anchylosed at metacarpo-phalangeal articulation, left toe at second joint also. A few small deposits on ears. Urine contains a very large quantity of albumen.

The patient died with symptoms of general anasarca.

The only joints opened were the left knee-joint, and

the middle joint of the right index finger. The lower end of the femur, the end of the tibia, and also the patella were covered with urate deposit, and the synovial membrane and ligaments around the joint sprinkled over as if dusted with a brush. The middle joint of the right index finger contained about one drachm and a half of mortar-like matter. Where there was no deposit of urate the cartilage was destroyed, and the bone in some places quite denuded. On making a transverse section over the dorsum of the first phalanx of the same finger, the tendon was seen firmly imbedded in urate of soda.

The left kidney weighed four and a half ounces, the surface was very granular and presented numerous cysts containing a glairy fluid: on section the cortical and interpyramidal substance was found deficient in quantity and granular in appearance; in some places the bases of the pyramids were not more than one-twentieth of an inch from the surface. In the pyramids there was a deposit of urate of soda, producing a streaky appearance when section was made in the direction of the pyramids, and a dotted one when cut in the other direction; the right kidney was similar to the left: the amount of deposit in the pyramids was somewhat greater. There was a large amount of fluid in the pericardium and pleura, with œdema of the lungs, and cardiac hypertrophy.

I have examined several of the smaller joints of other subjects of inveterate gout, which exhibited upon their surfaces evidence of deposition, and have made

sections in various directions, which have enabled me to trace the deep-seated origin of the chalk-like matter.

Plate 3, fig. 2, represents a horizontal section of a thumb, illustrating the manner in which the deposits take place, and the cause of the stiffening of the joint and subsequent anchylosis. It will be observed that a considerable amount of the chalky matter has been infiltrated into the ligamentous structures around the phalangeal joints, which alone must produce great crippling.

On carefully examining the drawing, it will also be seen that the articular surfaces of the cartilages are not adherent, or glued together, but that a cavity can be shown to exist, the matter being apparently deposited on the free surfaces of the cartilages, and not penetrating their whole thickness: the same appearance is also presented in the phalangeal joints of the fingers in fig. 3 of the same plate, where the disease is advanced to an extreme degree; for here not only are the ligaments around the small joints affected, but deposition has also taken place within the sheaths of the tendons, in the tendons themselves, and on the periosteum, to such an extent as to produce complete rigidity of the finger, and bulging of the deposited matter. Many of the tissues appear to be entirely converted into chalk-like matter, and in fig. 3 it will also be observed, that a small quantity of urate of soda is seen within the substance of the bone of the first phalanx; this is almost the only instance in which

I have met with a deposit within the osseous tissue, but even here the deposition appears to be in immediate connection with the matter in the articular cartilage.

As Cruveilhier stated that small cretaceous masses sometimes exist in the substance of the bone itself, quite removed from the cartilage, I have, with a view of testing this point, made numerous sections of bones taken from different gouty subjects, when the surfaces were completely incrusted, but in only two cases was I able to detect the slightest traces of urate of soda.

I consider this a question of importance, having a close relation to the pathology of the disease, believing that deposition can scarcely take place in a very vascular tissue, or, at any rate, in one whose circulation at the time is active. The amount of deposit in the finger (fig. 3) is so extensive that the blood-vessels must have been considerably pressed upon, and probably the circulation in the part was extremely defective, and the cretaceous-looking mass in the metacarpal end of the bone was immediately in contact with the cartilage, which was itself completely infiltrated. I have chemically examined bones where the cartilages were infiltrated, but could never detect a trace of uric acid in their substance.

There are on record some analyses of the bones of subjects of chronic gout, some of whom are stated to have had tophaceous deposits about the joints; one was made by Marchand of the upper part of the

femur, and of the radius and ulna of a person with chalk deposits on the knees and elbows. The results of his examination were as follows:—

	Femur.	Radius and Ulna.
Phosphate of lime	42·12	43·18
Carbonate of lime	8·24	8·50
Phosphate of magnesia	1·01	0·99
Animal matter	46·32	45·96
Fluorides of calcium, sodium, chloride of sodium, and loss	2·21	1·37

Lehmann also analysed the bones of three persons with chronic gout; their ages varying from 40 to 50 years. He found:—

	1	2	3
Phosphate of lime	35·16	35·83	37·22
Carbonate of lime	8·41	9·82	8·99
Phosphate of magnesia	1·31	1·05	1·13
Soluble salts	2·93	2·03	1·82
Cartilage	38·14	38·26	40·03
Fat	12·11	13·37	9·15

It will be seen that there was no uric acid in these bones, thus confirming my own observations; the chief difference between gouty and healthy bones appears to consist in the diminished quantity of earthy matter, and the large augmentation of the fat. Although I have not quantitatively determined the amount of fat in the bones of patients who have died from aggravated forms of gout, I am convinced that it often exists in large quantities, but whether this change is related essentially to this disease, or is merely dependent on imperfect nutrition, requires further observations to determine; it seems that other

tissues besides the bones are apt in these cases to become the seat of fatty degeneration.

One point in connection with the mode in which deposits take place, pointed out by Dr. W. Budd, and which has a considerable bearing upon the pathology of gout, or at least of its local manifestations, is the fact that urate of soda avoids the contiguity of blood-vessels. Dr. Budd states that in the larger cartilages, such as those of the knee-joint, immediately under the synovial membrane, and at the point where this membrane becomes attached to the border of the cartilage, there is a rich network of blood-vessels; from this a series of straight vessels arise, which pass to a certain distance over the free surface of the cartilage, forming loops, which often present considerable dilatations; wherever these vessels extend, the gouty matter is either very scanty or altogether absent. A margin of free cartilage surrounds them on all sides, so that the deposit seems, so to speak, to recede before the blood-vessel. This is clearly shown in Plate 3, fig. 1, *a*, where the mode in which the deposit has taken place on the surface of condyles of the femur is depicted.

All chalk-stones probably have their origin in fibrous or cartilaginous structures, and are never primarily connected with highly vascular tissues, although by increase of growth and the pressure thus induced, they may subsequently appear on the surface of the body; they are first observed externally in parts of the body where these structures approach

nearest the surface; as, for example, in the ears, on the palmar surfaces of the tips of the fingers, and in other like situations; it will be seen by reference to the drawing in Plate 3, fig. 3, how readily deposition in such parts become visible.

The same remarks especially apply to the white specks so frequently seen on the ear, and which are equally connected with fibro-cartilaginous tissue.

II.—*Examination of subjects of Gout, with no appreciable deformity, and no visible deposits of chalk-stones, except one or more specks on the cartilage of the Ear.*

Case 6.—The subject of the sixth case was a man about 50 years of age, with whom I was unacquainted; he was tall and strongly made, and had died of some acute disease. There were no appearances of deformity of the joints, the movements of which seemed to be performed with tolerable ease, and with the exception of three small nodules of urate of soda, upon the edge and fold of the helix of the right ear, no other deposits were visible externally.

The ear being more closely examined, the nodules were observed to be attached to the fibro-cartilage, bulging outwards, and separating the integuments; it was exceedingly difficult to detach them from the cartilage, as they appeared to penetrate into the very substance of that tissue. Under the microscope the white matter exhibited the crystalline appearance before alluded to (Plate 5, fig. 3), and consisted of

urate of soda, united with the elements of the structure in which it was imbedded.

Each kidney was small, under three ounces avoirdupois, and much contracted in size; on section, the cortical matter was found to be very deficient, and many white streaks of urate of soda were seen in the tubules of the pyramids: appearances which will be more fully described further on.

As there was so complete an absence of deformity, and merely the presence of a few nodules upon the ears, it was a matter of considerable interest to ascertain the condition of the joints, in order to discover whether deposits of urate of soda take place upon the ligaments and cartilages of the articulations, when external appearances would not indicate their presence.

The left knee was first examined; there were small patches of deposit upon the surface, and in the substance of the ligamentum patellæ, as likewise in all the other tendinous structures of the joint; in the former these spots were seen on the superficial layer, extending through to the surface of the bone; the patella itself was quite free from this matter, although sought for by making sections of the bone in various directions; the cartilage on the surface of the patella, which is turned inwards and performs part of the articulation, was of considerable thickness, and sprinkled on its surface and throughout its substance with small white points, some of the spots in the interior not being connected with those on the surface. The articular surface of the femur was marked on both condyles

with a small amount of plastery deposit, apparently smeared in streaks over the surface of the cartilages, as shown in woodcut, fig. 15. The tendons at their

Fig. 15.*

point of insertion into the condyles of the femur were also incrusted, especially on the surface corresponding to the small indentations in the condyle of the bone; the semilunar cartilages were freely sprinkled; the anterior and posterior crucial ligaments were whitened

* Fig. 15 represents the end of the femur, showing the deposition of urate of soda in streaks upon the surface of the condyles. No chalk-stones were visible externally, except two or three small spots on the cartilage of one ear.

externally, and on section, presented in their interior large spots of this deposit. The articular surface of the tibia was streaked in a similar manner to that of the femur, but less extensively; some patches also existed between tibia and fibula.

The right knee was affected in the same way as the left.

The great toe joint was found to be extensively diseased, the articulating cartilages being completely covered, as also the surrounding ligaments, forming in fact a complete solid case.

In the upper extremities the following changes were observed.

The anterior and posterior ligaments of the wrist joint which was examined were sprinkled with a white deposit; a small nodular deposit existed on the external surface of the styloid process of the ulna; the articular cartilage between the radius and ulna was covered with white urate deposit on both surfaces, so also were the articular cartilages corresponding to the wrist joint both on the carpal and radio-ulnar portions; over these surfaces it existed in very much larger quantities than in the knee joints. The fingers were variously affected; in some the sheaths of the tendons were the seat of the deposit, the tendons themselves being completely free; in others, as the index fingers, one joint had the articular cartilage and tendon free, another the surface healthy but the tendon with a very slight deposit on its surface; upon the whole, the tendon and ligaments, especially those around the

joints and at the points of insertion into the heads of the phalanges, were more generally affected than the articular cartilages themselves.

The ligaments connecting the carpal bones to one another and also to the metacarpus, and likewise the carpal ends of the metacarpal bones, especially on their dorsal surfaces, appeared to be one mass of chalk-like concretion.

Carpus.—All the articular surfaces of the cuneiform, semilunar, and scaphoid bones were covered with a layer of white matter, which penetrated and incrusted the ligaments uniting these bones; the ligament connecting the semilunar with the scaphoid was one mass of this matter; the cartilage on the surface of the cuneiform articulating with the pisiform bone was also implicated. All the cartilages of the articular surfaces of the unciform, os magnum, trapezium, and trapezoid, and the corresponding surfaces of the first row of carpal bones were more or less covered, those of the unciform and os magnum particularly so. The articulating surfaces of the second row of carpal bones with the metacarpal were still more uniformly and thickly covered, likewise the carpal surfaces of the metacarpal. The sheaths of the flexor tendons, also the tendons themselves, were superficially incrusted, and, in places, the plaster-like matter extended into the substance of the tendon.

The following were the appearances seen in dissecting one of the fingers of this subject, in which the disease had not made great ravages, as some of

the cartilages were unaffected and others very partially injured.

The cartilage of the metacarpo-phalangeal joint appeared quite healthy, but at the point of attachment of the lateral ligaments, a small amount of the white deposit was observed on each side.

The surface of the first phalangeal joint was partially covered with a thin layer, but much healthy cartilage was visible, and chalk-like deposit existed in considerable amount at the point of attachment of the lateral ligaments with the bone. The same phenomenon was seen in the second phalangeal joint; the tendons in the finger were found healthy, but many spots of matter were seen upon the sheaths.

Several joints in this subject were perfectly healthy, for example, the hips and shoulders, and the left elbow; but the right elbow joint showed considerable incrustation of the cartilages of the humerus, ulna and radius.

In most of the affected joints there was some thick white synovial fluid, which when put under the glass exhibited a crystalline appearance from the contained urate of soda. (Plate 5, fig. 3.)

Case 7.—In 1858 I had an opportunity of making an examination of the body of a gouty man, who did not present to ordinary observation any appearance indicating the presence of chalky deposit.

The following is a short history of his case, taken during life. About 44 years of age, stout, of mode-

rate height, with no hereditary predisposition to gout; had always lived well, and drank rather freely of porter, occasionally mixed with gin; had been exposed to some hardships, and was laid up with yellow fever in Spain. The first fit of gout occurred twelve years before his death, in the ball of one great toe, the second a year after in the same locality; since the latter date he has had several attacks in which the ankles, knees, elbows, shoulders and hips, have been affected; his death was very sudden and depended on cardiac disease; the heart after death was found to weigh nearly fourteen ounces, and there was evidence of much fatty degeneration of its tissue.

During life this patient was free from any stiffness or deformity of joints, and no concretions were visible, saving two or three very minute points on the helix of the left ear, none of which were so large as the head of the smallest pin; in fact, so small were they, that only a most minute and special search would have enabled any one to discover their existence. The post mortem inspection gave the following results in reference to the joints.

The surfaces of the bones in the metatarso-phalangeal joint of both great toes were found completely covered as if with white paint; there was also some redness of the synovial membrane. The right knee-joint, which had been recently inflamed, exhibited much vascularity both of the synovial membrane and fringes. The synovial fluid had a distinct acid reaction, and was speckled here and there with white points.

The outer condyle of the femur was streaked with white patches, the inner also, but in a somewhat less degree; that portion of the surface of the condyles in contact with the synovial fringes was free. The articular surface of the patella was irregularly spotted. The head of the tibia was similarly streaked to the femur, and the surface corresponding to the outer condyle had more white deposit than the rest. The fibro-cartilages were found strongly infiltrated, and spots of urate of soda were visible upon the crucial and other ligaments. The synovial membrane throughout the whole joint was finely sprinkled with minute white granules, the nature and structure of which will be described further on.

The left kidney was notched and contracted, and weighed two ounces and a quarter, the removal of the capsule caused some injury to the cortical portion, which was distinctly wasted. At the mamilla of each pyramid white points were observed, and streaks of the white matter seen in the pyramidal portion.

The right kidney weighed three ounces and a quarter, and exhibited the same appearances as the left. The heart was enlarged, some atheromatous deposits were seen on the aortic and mitral valves, and much fat in its muscular fibres.

Case 8.—In 1859 I made the autopsy of a man 57 years of age, who died from the effects of a severe accident. He had suffered previously from about twelve attacks of gout; the early fits were chiefly

confined to the great toes, but the latter had implicated the knees, wrists, and hands. With the exception of a single speck of urate of soda about the size of a large pin's head, situated upon the helix of the right ear, no external deposits were visible, and there was an absence of any marked stiffness or deformity. An examination was made of the right hand, which had been seriously injured by the accident, and amputated during life, also of both great toes and knees, and several other articulations. In the metatarso-phalangeal joint of each great toe, the cartilages were completely infiltrated with urate of soda, the surfaces of the sesamoid bones and ligaments exhibiting an appearance resembling Fig. 16, but more strongly marked; many of the other joints of the feet were slightly affected; the knees were streaked with the white matter to about the same degree as in Fig. 15. Nearly all the surfaces of the carpal and metacarpal bones, as also those of some of the phalangeal joints, were likewise incrusted.

The kidneys were congested and granular, each weighing nearly six ounces avoirdupois, and, on careful examination, white points and streaks of urate of soda were observed at the ends of the pyramids, and in the direction of the tubuli. The urine was strongly albuminous. The deposits in the cartilages, ligaments, synovial membranes, and kidneys on microscopical examination exhibited a crystalline appearance.

3. *Examination of subjects of gout, in whom no trace*

of chalky matter was externally visible, and in one case eight attacks only of the disease had occurred.

Case 9.—J. S., a male subject, about 52 years of age, with whose previous history I am unacquainted. The body presented no deformity and there was an absence of rigidity of joints, except of the metatarso-phalangeal articulation of the right great toe; not the slightest appearance of chalky deposit even on the ears was visible, although carefully sought for. The joints of the upper extremities were found on examination to be healthy, even the smaller articulations of the carpus, metacarpus, and phalanges; the same was the case with the hip joints, but in the knees the articular cartilages of the femur, tibia, and patella were freely incrusted with urate of soda, as also almost all the bones of the tarsus and metatarsus, and some of the phalangeal articulations. The ball of the right great toe was anchylosed by the large amount of deposit in the surrounding ligaments, and a mass of considerable size was found to penetrate into the substance of the first phalanx. The astragalus, os calcis, tibia, and femur exhibited no appearance of this matter in their structure, but the tissue was soft from fatty degeneration.

The synovial fluid appeared healthy, no crystals were visible in it, but the membrane of the knee-joints showed a fine sprinkling of white points. Some of the toes were carefully examined, in order to ascertain the exact point where deposition first takes place in the joints; in no case was it observed in the

ligaments where the articular surface was not also implicated. The kidneys were small and shrivelled; each weighed three ounces avoirdupois, and the removal of the capsule caused injury to the cortical portion, which had become wasted. At the apex of each cone white points were observed, and streaks of the same matter were seen to radiate in the direction of the tubuli.

Case 10.—I am indebted to my friend Mr. J. Clover for the following observations, which were particularly valuable to me, being the first made on a gouty subject who presented no deformity or external deposits of chalky matter.

J. T., a gentleman aged 75, who had suffered from gouty attacks for thirty years, but in whom the disorder had never assumed a chronic form, nor induced either stiffness of joints or other appreciable injury. At the time I saw him he was suffering from obstinate diarrhœa, which caused fatal exhaustion. Permission was given to examine one great toe, and the metatarso-phalangeal joint was found much diseased, spots of chalky matter being seen on the external surface of the ligaments and in the groove of the peroneus longus muscle; when the joint was opened, the rounded head of the metatarsal bone, and the cup-like extremity of the phalanx, were discovered to be much incrusted, as also the sesamoid bones. The surface of the metatarsal bone, articulating with the internal cuneiform, was healthy, as also the pulley-like end of

the first phalanx. The synovial fluid was somewhat thick, alkaline in re-action, and the synovial membrane studded with minute white specks of urate of soda.

Case 11.—W. J., a gentleman, aged 49, a surgeon by profession, not inheriting gout, but who had evidently acquired the disease by free living. The first fit occurred about thirteen years before his death, and was confined to the ball of one great toe; in the second attack one of his knees was affected as well as the great toe; he had suffered altogether from eight attacks, but had not had any during the last eighteen months; once only did the disease extend to the upper extremities, and then a single joint of one of the fingers became implicated. About six months before his death he began to suffer from symptoms of hepatic disease and afterwards from ascites, for which latter he was tapped. His death resulted from the diarrhœa and exhaustion which followed the operation.

During life he was not troubled with stiffness or deformity of any joint, and not the slightest appearance of urate deposit was seen either upon the ears or elsewhere; in fact he did not consider himself a very gouty subject. No trace of albumen was present in the urine.

On post mortem examination, the liver was found contracted, the capsule thickened, and the surface of the organ somewhat uneven. On section, the structure was seen to be coarsely granular. There was

some hypertrophy of the left ventricle of the heart, and atheromatous deposits on the aortic semi-lunar valves.

Examination of joints.—In the left great toe the head of the metatarsal bone was seen sprinkled with deposits of urate of soda, as was also the cup-shaped end of the first phalanx; white patches were likewise seen on the articulating surfaces of the sesamoid bones, and the ligament had a few spots upon its internal surface. These appearances are depicted in fig. 16.

Fig. 16.*

The ball of the right great toe was similarly affected, and in about the same degree. The synovial fluid in

* Fig. 16 represents the appearance of the articulating surfaces of the bones of the ball of the left great toe of W. J., in whom only eight attacks of gout had ever occurred; no trace of deposits was seen externally, and no appreciable stiffness of the joints or deformity existed.

both joints was distinctly alkaline in re-action and normal in appearance.

The heads of the femur and tibia and the articulating surface of the patella of both knees were pretty freely sprinkled with white patches, and points of the same could be seen upon the synovial membrane throughout the joints.

The kidneys exhibited the peculiar phenomena so commonly seen in this disease, although, I believe, never before ascertained to be present in subjects who had only suffered from a few attacks of acute gout.

Case 12.—May, 1859. A man 37 years of age, a butcher by trade and not inheriting gout, but had suffered from it for ten years, first in the great toes and afterwards in the ankles, knees, and wrists; of late as many as three or four attacks occurred annually; for some time he had suffered from much difficulty of breathing, and the urine was albuminous; he died from peritonitis. For the last six months he had not been troubled with gout.

Not the slightest trace of external deposits of urate of soda was observed, not even a speck on the ears, nor was there any deformity or stiffness of the joints. On opening the metatarso-phalangeal joints of each great toe, the cartilages of the bones, including the sesamoid, were found much encrusted with a white deposit of urate of soda, some white matter also was seen in the ligamentous structures. The phalangeal joints were perfectly free from the disease.

A very slight streaking was observed in the right knee-joint and on the condyles of the femur and surface of the tibia, but none in the right elbow; the other articulations were not examined.

The left kidney was short and thick, capsule very opaque and adherent, and, on attempting to remove it, the surface of the cortical substance was much injured, and exhibited a granular appearance. Weight, five ounces avoirdupois.

The right kidney similar in appearance to the left, but with a large cyst on its surface, extending into the cortical structure. At the end of the pyramids of both kidneys white points were observed, and many streaks along the course of the tubuli uriniferi; the points and streaks exhibited a crystalline structure under the microscope and were composed of urate of soda.

Case 13.—August, 1859. J. S., a man aged 59, who died from the effects of an accident. The circumstances connected with the case were as follows:—He was thrown down by a cab, which caused some injury to the right knee, and a bruise of a slighter character in the left foot. Gangrene occurred in the right leg, which made it necessary to have recourse to amputation of the thigh; the stump became affected in a similar manner and the patient soon died from exhaustion. From the history of the case obtained from his wife, it appeared that he had been subject to occasional attacks of gout for the last ten years,

affecting principally the great toes and ankles, and now and then a joint of the upper extremities. He had also experienced one slight attack in the left knee.

The pathological appearances discovered after death, as far as the gouty affection was concerned, were as follows:

The cartilages on the head of the metatarsal bone and first phalanx of the right great toe were encrusted with urate of soda over more than half the extent of their surfaces, and some deposit was present on the sesamoid bones; specks of the same matter were likewise seen on the inner surfaces of the ligaments. The left great toe was similarly affected, but in a slighter degree, and the ankle bones of the same side exhibited white patches of the salt; no trace of deposit was found in the right knee-joint. As it had been previously ascertained that the patient had experienced *one slight attack* of gout in the left knee, it became a matter of extreme interest to observe the condition of this joint, and ascertain whether any morbid appearances remained from this attack, which had occurred some years previously. No deposit was observed on the surfaces of the tibia articulating with the condyles of the femur, the inner condyle of the latter bone was likewise free, but on the anterior portion of the outer condyle a small patch was seen, not exceeding a sixth of an inch in breadth, and about half an inch in length, the deposit gradually becoming less dense from before backwards; in the notch between the condyles a very

small spot was likewise seen; a speck about the size of a peppercorn was found near the tuberosity on the outer side of the external condyle, connected with the lateral ligaments. A considerable amount of urate of soda was seen on the articulating surface of the patella, almost entirely confined to the outer half; a portion of this was very superficial, but some deep seated in the cartilage, approaching close to the osseous tissue.

Fig. 17.*

In the ligamentous structures upon the outer surface

* Fig. 17. A knee-joint, showing the deposition of urate of soda resulting from one slight attack of gout.

of the patella, minute specks of the same salt were visible; these appearances are delineated in fig. 17. The only other morbid phenomenon presented by the joint were a few scattered and very small white points upon the under surface of the internal semi-lunar cartilage, but too small to be exhibited in a woodcut; the crucial ligaments were quite free.

Both kidneys were small and pale; the right weighed three ounces, the left two ounces and three-quarters. On removing the capsules, the surface presented a granular appearance, and on section, the cortical substance was found to be wasted. A deposit of crystalline urate of soda in the form of spots and streaks was seen at the mamilla of each pyramid, and in the direction of the tubuli. The urine was not examined.

Case 14.—C. H., a man 50 years of age, inheriting gout both from father and mother's side; his habits had been temperate, he had an attack of gout four or five years ago in the ball of great toe, and again six months afterwards, but has never had more than four or five attacks.

This patient had suffered for the last six months from dropsy consequent on cardiac disease, from the effects of which he gradually died.

On section there was found much deposit of urate of soda in the balls of both great toes, no other joints were affected.

There was much disease of aortic and mitral

valves, with considerable cardiac hypertrophy; the kidneys appeared healthy.

4. *Examination of a subject in which only the ball of the right great toe had been affected with gouty inflammation.*

Case 15.—R. R., a man aged 50, with no known hereditary predisposition to gout; during the last ten years he had suffered much from palpitation and difficulty of breathing, symptoms depending on the presence of hypertrophy and valvular disease of the heart; he had also been much troubled with cough; he had always lived well, and had drunk freely of malt liquors. Three years and a half before his death a distinct fit of gout occurred in the ball of the right great toe, of moderate severity; and a year afterwards a second fit in exactly the same situation; in neither attack were other joints implicated. From the time of the second attack until his death he had not the slightest return of gout. No albumen was present in the urine. A post-mortem examination revealed considerable cardiac disease, the heart weighing twenty-six ounces avoirdupois; the walls of the left ventricle were much thickened and the aortic valves covered with excrescences, and altogether inefficient; the kidneys, weighing six and seven ounces respectively, were apparently healthy, with the exception of a large cyst in the right. The metatarso-phalangeal articulation or ball of the right great toe, the only joint ever inflamed, exhibited the following appearances when

opened:—A moderate amount of synovial fluid was present, healthy in appearance, and distinctly alkaline in re-action. A large white patch was seen on the head of the metatarsal bone, occupying about one-tenth of the whole surface, and when carefully examined found to consist of several minute patches aggregated together; on the surface of the cup-like end of the

Fig. 18.*

phalangeal bone more of this white matter was observed, occupying perhaps as much as one-fourth of the cavity; the deposit was not dense, and did

* Fig. 18 (1). Drawn from the ball of the right great toe of R. R., a patient who only experienced two slight attacks of gout, both confined to the joint in question.

Fig. 18 (2) represents the appearance of the end of phalangeal bone of the corresponding joint of the left great toe, in which no trace of urate of soda existed.

not appear to cause any elevation of the surface. The articulating surfaces of the sesmoid bones were free. These appearances are represented in fig. 18 (1).

Besides these deposits, it will be observed that there was a very distinct sprinkling of the same substance upon the inner surface of the ligaments.

The corresponding joint of the left great toe was healthy, as also the phalangeal joints of both feet, and several other joints of the body which were examined. Fig. 18 (2), exhibits the appearance of the cup end of the first phalanx of the healthy toe. The deposit shown in the drawing was examined microscopically and chemically, and found to be identical both in form and composition with that constantly found in this disease, and which will be fully described in the next chapter.

5. *Examination of a subject in whom but a single attack of gout had occurred, and that thirteen years before death.*

Case 16.—E. R., an ostler and coachman, aged 45, had always lived well and never taken more than four or five pints of porter daily; did not inherit gout from either parents.

About thirteen years ago had an attack of gout in the right great toe, which lasted for about a fortnight and was severe; with this exception he had always enjoyed good health, and has never had a return of the gout.

He died from cardiac disease accompanied with hæmoptysis and pulmonary apoplexy.

The metatarso-phalangeal joint of the right great toe was found much encrusted with white patches of urate of soda, the cups of the phalanx being more than three-fourths covered, the head of the metatarsal bone less so; on the phalangeal joint of the same toe a few white spots were also seen: these appearances are accurately depicted in fig. 19.

Fig, 19.*

The patient had only spoken of the gout as affecting the right great toe, and he particularly remarked on the intensity of the pain in that part; however, on opening the first joint of the left great toe a few specks were seen; and one minute point in the phalangeal joint; the appearance in the former joint is delineated in fig. 20. The knees contained no trace

* Fig. 19. A drawing from the right great toe of E. R., a man who had but a single attack of gout 13 years before death.

of deposit, nor was any discovered in any other joint inspected.

Fig. 20.*

The kidneys were congested, weighing 6½ ounces each, and no white points or streaks observed.

* Fig. 20. The metatarso-phalangeal joint of left great toe, from the same man from whom fig. 19 was drawn.

CHAPTER VII.

MORBID ANATOMY OF GOUT CONTINUED:—DEDUCTIONS DRAWN FROM THE CASES RELATED IN THE LAST CHAPTER—PROOFS OF THE INVARIABLE DEPOSITION OF CHALKY MATTER IN THE INFLAMMATION OF TRUE GOUT—MICROSCOPIC AND CHEMICAL CHARACTERS OF GOUTY DEPOSITS IN DIFFERENT STRUCTURES—IN ARTICULAR CARTILAGE—SYNOVIAL MEMBRANE—FIBROUS TISSUE—ANCHYLOSIS OF GREAT TOE—CHANGES IN THE KIDNEYS OF GOUTY SUBJECTS: 1. IN THE CHRONIC FORMS OF THE MALADY; 2. IN THE EARLY STAGES—DEPOSITS IN OTHER SITUATIONS.

FROM an investigation of the phenomena brought to light in the last chapter, more especially with regard to cases of gout in which no appreciable deformity or rigidity of joints existed during life, some very important deductions may be drawn; deductions which cannot fail to exercise a strong influence upon our views of the intimate nature of the disease, and which we shall now endeavour to explain.

In the examination of the first class of cases—namely, subjects of chronic gout, with extensive chalk-stones—the results of my observations, as far as the appearances to the naked eye are concerned, have already been sufficiently detailed: such, for instance, as the more or less complete incrustation of the surfaces of the bones with urate of soda, the infiltration of the surrounding ligaments, deposits within the tendons

and their sheaths, and occasionally along the tendinous expansions of the muscles. After a time, when the secretion of urate of soda into the tissues increases, neighbouring parts are pressed upon, atrophied, and absorbed, and the deposited matter slowly approaches the surface, usually in a semi-fluid form at first, but gradually becoming solid and chalk-like from the absorption of its more fluid portion. When there is only an integument covering the cartilage, as in the case of the helix of the ear, the deposit makes its appearance at the surface soon after its secretion, but when many other structures are interposed, a considerable time elapses before this occurs, and the deposited matter may undergo considerable hardening from absorption. The only point in which my observations differ from those of Cruveilhier has reference to the occurrence of the deposit within the substance of the bones and altogether disconnected with the cartilage. Cruveilhier found it in the astragalus, os calcis, and patella; I have frequently sought in these situations, but have never seen it except in direct connection with the cartilage, although in some of the phalanges it had penetrated to a considerable depth, and the osseous tissue had become much pressed upon and atrophied.

In the second class of cases, when no appreciable deformity was present during life, and no chalk-stones except one or two on the cartilage of the ears, the examination brought to light the fact, I believe before unknown, that extensive deposits may

take place within the joints without corresponding external manifestation; it was also rendered probable that a close relation exists between the presence of the deposit and the occurrence of true gouty inflammation; for in Case 6 the joints less commonly implicated were free from deposit, as both hip and shoulder-joints, and one elbow, whereas the joints more frequently affected with gout were found incrusted. As the history of the case was unknown, there were no means of positively ascertaining which joints had been inflamed during life.

In the third class, when not a trace of external deposit was perceptible, it was likewise demonstrated that the cartilages and other structures of the joints may be infiltrated with urate of soda.

In Case 10 one great toe only was examined, and here the interesting fact was elicited, that the articular cartilages of the metatarso-phalangeal joint may be completely incrusted, the surrounding ligamentous tissues freely sprinkled, and still the articulating surface of the metatarsal bone with the tarsus, and likewise the phalangeal joint, remain free from disease; this I have seen in other instances, and it exemplifies the great tendency of gout to select one joint in preference to others.

In Case 9 many joints of the lower extremities were affected, but with complete freedom of the upper limbs and hip-joints; thus pointing to the same conclusions as Case 6, but in a still more marked degree.

By Case 11 we are enabled to confirm in a remarkable manner the conclusions to which the foregoing cases point. The history was well known; the patient had been a medical man, and could give the details with accuracy, and it was positively ascertained that he had experienced but eight fits of gout, and these had been spread over a period of thirteen years; once only was a finger affected, the remaining attacks being confined to the great toes, feet, and knees. In this case the examination showed an incrustation of all the joints known to have been implicated, and the freedom of the rest, and thus proved almost to demonstration that gouty inflammation is invariably accompanied with deposition of urate of soda.

In Case 15 this fact was proved beyond all reasonable doubt, for the patient had only experienced the disease in a single joint, the ball of one great toe, and even in this it had not been severe; still the surfaces of the metatarsal bone and phalanx were sprinkled over in a marked degree, and a spot was likewise observed on the ligament.

Cases 13 and 16, however, establish the fact absolutely. In Case 13 evidence was obtained during life that the left knee had been only once affected with gout, and then very slightly, the right knee having been always quite free from the disease; the post-mortem examination demonstrated a slight deposit in the structures of the left knee, but none in the right.

And, lastly, in Case 16, the result of a *single* fit of gout was characteristically revealed. After this

evidence, how is it possible to doubt that *gouty inflammation is invariably attended with the deposition of urate of soda?*

The other morbid appearances seen in joints affected with gout are comparatively unimportant, being similar to those observed after other forms of inflammation, as redness, thickening, and dryness of the synovial membrane, and occasionally effused fluid; but these phenomena vary much with the time which has elapsed since the commencement of the attack.

The establishment of the fact that gouty inflammation is invariably accompanied with the deposition of a peculiar salt is of the highest importance, inasmuch as it proves the inflammation to have a specific character, and to differ entirely from the various other morbid affections of the joints with which it has hitherto been confounded.

I may add here that although I have made many examinations of the joints of the subjects of different articular diseases, in no other affection have I ever detected this deposition on the cartilages or elsewhere. It never occurs in acute or chronic forms of rheumatism, nor in rheumatoid arthritis, the disease commonly known by the name of chronic rheumatic arthritis, although alterations of a still more serious nature are frequently met with in this last affection.

I am of opinion that not only is the deposition of urate of soda constantly found in gouty inflammation, but that it stands in relation to it of cause rather than effect, that is to say, the deposition of the salt first

takes place in the synovial membranes, cartilages, and tendinous structures of the joints, and by its presence gives rise to inflammatory action. Many arguments might be adduced in support of this statement, which we shall have an opportunity of more freely discussing in a future chapter; I may, however, allude here to two circumstances strongly favouring the above view; namely, that when deposition occurs in parts of low vitality, as in the fibro-cartilages of the ears, there is comparatively little inflammation, although often sufficient to call forth the attention of the patient; again, when inflammation runs high, destruction of the urate of soda to some extent results, as proved by the absence of uric acid in the blister serum of the inflamed part.

Microscopic and Chemical Characters of Gouty Deposits in different Structures.—We have spoken of the white plaster-like matter as occurring upon the cartilages, in the tendons, and other parts, without particular reference either to its minute characters or chemical composition; to these points it is incumbent upon us now to direct our attention. In the description already given of the morbid appearances, we have seen that the chalky deposit has been sometimes stated to replace the cartilage supposed to have become absorbed, sometimes to have been spread over its surface in the form of a thin layer, the cartilage remaining intact; both these statements are erroneous, for as we proceed in our inquiries we shall

find that the white deposit is altogether interstitial in character.

In a communication on Gout published in the Transactions of the Royal Medical and Chirurgical Society, 1848, I gave a drawing of articular cartilage taken from the metatarsal bone of a gouty patient, whose foot had been amputated by the late Mr. Liston, and it was there shown that the white deposit was entirely crystalline, consisting of minute needles of urate of soda, arranged in the manner exhibited in Plate 5, fig. 2.

Subsequently I exhibited a specimen at a meeting of the Pathological Society, proving that the deposit was not on the free surface of the cartilage, but that a thin organic layer could often be demonstrated external to it. Since this period Dr. W. Budd has particularly examined the structure of such cartilage, and the results of his investigations are published in the Medical and Chirurgical Transactions for 1855.

If we make a thin vertical section of a piece of cartilage containing this deposit, that is, a section cut from the free surface in the direction of the bone, we at once discover that the matter ordinarily extends to a comparatively small depth into the substance, seldom penetrating beyond two-thirds of its thickness, often much less, and it will also be seen that this deposit presents a beautifully crystalline appearance, as seen in Plate 5, fig. 1. The phenomenon can be well observed when we examine the specimen with a linear magnifying power of from 100 to 200, either by

transmitted or reflected light, and still more satisfactorily by the aid of polarised light. Dr. Budd, in the paper above alluded to, states that the foreign matter takes two distinct forms, in some situations being granular or amorphous, in others perfectly crystalline. I have made some hundred sections of cartilage taken from many gouty subjects, and from various joints, and although the matter has at first occasionally presented the granular form, yet further examination, more especially by the aid of the polariscope, has always shown it to consist of minute crystals, the amorphous appearance having been due to the direction of the needles, and not to any want of crystallisation. In the drawing, Plate 5, fig. 1, the thin membranous layer external to the deposit will be observed, a phenomenon which has also been described by Dr. Budd in the communication before alluded to: Mr. Toynbee, in a paper on articular cartilage, in the London Journal of Medicine, 1850, considered that this discovery of the thin organic layer, argued strongly for the existence of a synovial membrane over the articulating surfaces. In Plate 5, fig. 2, a horizontal section of the cartilage is shown; the crystals, however, are seldom met with so symmetrically arranged. The above drawing was made in 1848, from the specimen given to me by Mr. Liston.

The density of the deposit is always found to be greatest at the surface, gradually becoming less as it penetrates into the structure. In bones which are only moderately sprinkled, the penetration does

not often exceed one-third of the whole thickness, or at least the crystals become so few and fine that they are not visible beyond this depth unless great precautions are adopted, but sometimes upon the end of bones which have long been the seat of the disease, the entire thickness of the cartilage seems to be implicated. The appearance presented by a thin vertical section when seen under polarised light, is represented in fig. 21, the fine prismatic needles are observed to penetrate to some considerable depth: near the surface the light is intense from the interlacement of innumerable crystals. When properly exhibited as an opaque object it is also very beautiful.

Fig. 21.*

In order to determine the intimate nature of the deposit within the cartilage, we have only to take thin slices of it, wash them with cold water and afterwards with alcohol, for the purpose of removing any matters readily soluble in such menstrua, then digest in warm water, under 200° Fahr., until the cartilage has become transparent; the watery solution,

* Fig. 21. The appearance presented by a very thin vertical section of gouty cartilage: the matter is seen to be most dense at the free surface, and gradually to become thinner as it penetrates into the structure. From a specimen preserved in Canada balsam. Linear magnifying power 220. Polarised light.

after evaporation and cooling, will deposit beautiful tufts of crystals (Fig. 22), which can be readily demonstrated to consist of pure urate of soda, as a soluble alkaline ash is left, after incineration, consisting of carbonate of soda, and the crystals dissolved in water, and treated with acetic acid, give rise to uric acid in its characteristic rhombic forms. (Plate 6, fig. 1.) If the crystals be treated with dilute nitric acid on a piece of white porcelain, and, when almost dry, held over a solution of ammonia, they give rise to a brilliant purple appearance from the production of murexide. By these reactions, as well as from the forms in which the salt crystallises, it can be demonstrated, that the matter giving the white opacity to the cartilage consists solely of urate of soda.

Fig. 22.*

When the extremity of a bone completely and thickly covered with urate of soda, is digested in warm water for some days, the whole of the deposit is removed, and it then presents an almost healthy appearance, being left completely covered with cartilage. In some of my experiments I should have

* Fig. 22 represents the crystallisation of urate of soda from the watery solution in which gouty cartilage had been digested, seen under polarised light. Linear magnifying power 220.

been unable to determine whether it had been previously diseased, for the only difference which I have observed, has been a somewhat uneven surface and a transparent and spongy appearance of the cartilage on drying. To ascertain this point without risk of error, I have taken the end of two bones from the same individual, and subjected them to similar influences, either to water at the temperature of 100° Fahr., or to

Fig. 23.*

the action of a weak solution of the carbonate of some alkali. Fig. 23 shows the appearance of two meta-

* Fig. 23 represents the ends of two metacarpal bones, one incrusted with urate of soda, the other freed from the deposit by the action of warm water, and exhibiting the cartilage apparently healthy in structure.

carpal bones, one incrusted with the deposit, the other freed from it by the long continued action of warm water: the latter was, if anything, more thickly covered than the former before the commencement of the experiment. These observations prove beyond doubt, that the idea of the supposed absorption of the cartilage, and the after superposition of a layer of foreign matter, is erroneous, and that the deposition is entirely interstitial in its nature. If thin layers of gouty cartilage are submitted to the action of warm water for some hours, the deposited matter will be gradually dissolved until at length it is quite removed, after which the cartilage will be found to have recovered its healthy structure. By such a mode of proceeding, watching the specimens in the different stages, much light will be thrown upon the mode in which the deposition has originally taken place. In some specimens I have noticed, that after much of the urate of soda has been removed by the water, rhombic crystals of uric acid have been left within the cartilage; it is however probable, that the reduction of the acid is only a post-mortem effect from the generation of another acid by decomposition. In almost every case I have observed, that as the solution of the urate of soda proceeds, the deposit assumes the appearance of small masses of crystals separated from each other by clear interspaces, and after the further action of the water, such masses have often appeared to occupy the situation of the nucleus cells of the tissue (Plate 5, fig. 1).

In detailing the post-mortem examinations of the joints of gouty subjects, we stated that the synovial fluid was occasionally of a thick consistence, and more or less opaque, sometimes studded with little white points; when examined by the microscope, it is found to be crystalline, exhibiting fine needles, or prisms, usually aggregated together in the form of bundles. The crystals are soluble in warm water, the solutions yielding the characteristic murexide test, and on the addition of an acid, depositing rhombic crystals of uric acid: in short, the opaque matter within the synovial fluid is proved to be urate of soda, the same salt that exists within the cartilaginous structure; in some of the more chronic forms of gout, masses of white matter have been found; this, however, does not commonly happen, and even in joints very considerably affected, the cavities often remain free from deposit, although white points may be visible in the synovial fluid.

In speaking of the dissections of the larger articulations, and more especially the knee-joint, very minute white points have been noticed as occurring upon the synovial membrane; if a portion of this tissue be removed, and placed under the microscope with a low magnifying power, about 60 linear, with the use of polarised light, an appearance represented in Fig. 24 (1) is observed, showing the studding of the membrane with small white masses, arranged at somewhat equal distances from each other. When a very minute mass is selected and subjected to a higher

power, about 220 linear, the crystalline structure becomes apparent, especially if a little pressure be used upon the thin upper glass covering the membrane, by which means the globular mass becomes flattened and the needles of urate of soda rendered more evident; this is represented in Fig. 24 (2), When the membrane is submitted to the long continued action of warm water, the masses are gradually dissolved, and the tissue left in an apparently normal state.

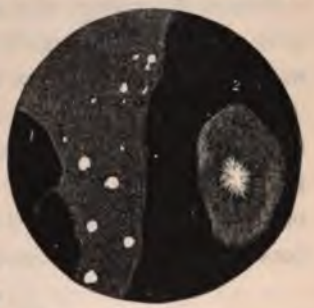


Fig. 24.*

Ligamentous and fibro-cartilaginous tissues, tendons and their sheaths, when incrusted with urate of soda, present under the microscope appearances very similar to those of articular cartilage, although it frequently happens that the crystalline structure in the former, is not so regular as in the latter, or in the synovial membrane. I may here remark, in concluding this part of the subject, that in whatever tissue or situation, urate of soda is deposited, it invariably exhibits a crystalline appearance, although sometimes the prisms are exceedingly small, requiring high magnify-

* Fig. 24. A drawing from a small piece of synovial membrane from the knee-joint, under polarised light. (1) Shows the appearance with a magnifying power of 60 linear. (2) One of the smaller points with a magnifying power of 220 linear, exhibiting the crystalline structure.

ing powers and the use of polarised light to define them very clearly.

When describing the mischievous consequences arising from acute gout, it was remarked that permanent stiffness or complete anchylosis of the first joint of the great toe might occur after only a few attacks. On two occasions I had the opportunity of ascertaining the exact condition of the parts thus injured; in one case, on making a perpendicular section of the bones, an appearance represented in fig. 25, was seen.

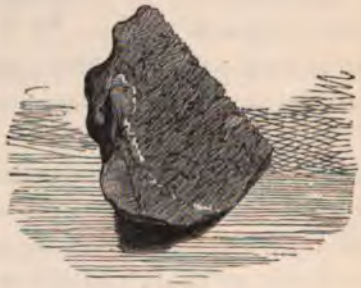


Fig. 25.*

It will be observed that the curved white line, indicating the position of the joint, is broken at intervals, as if, subsequent to the deposition of the urate of soda, the bony structure of the cup of the phalanx had given way, and the head of the metatarsal bone had been forcibly thrust into it; in Case 4, this change had proceeded much further, as will be seen from the

* Fig. 25 represents a perpendicular section of the first joint of a great toe which had become anchylosed after a few attacks of gout.

description given in Chapter VI. Further on, when discussing the nature of gout, we shall have to notice the liability of this joint to injury, even in individuals not suffering from any articular affection, and this will probably explain the cause of its frequent stiffness in gout.

Changes in the Kidneys of Gouty Subjects.—It has long been a prevalent idea that some connection exists between gout and an altered secretion from the kidneys, an opinion probably derived from the supposed frequency of the occurrence of gout and gravel in the same individual, strengthened by the fact that the most common constituent of urinary gravel and calculus is almost identical with the chalky deposits of gout. It is true that gout and gravel are frequently met with in the same patient, occasionally simultaneously, but more commonly at different periods of life; those who in youth were subject to the latter, in middle life and old age frequently suffer from the former.

Some years since Dr. Todd drew the attention of the profession to a condition of the kidney which frequently occurs in cases of inveterate chronic gout, and named by him the gouty kidney, but I believe there is nothing published throwing any light on the changes in these organs in patients who have only suffered from the acute variety of the malady. Latterly I have been enabled to speak more positively upon this subject, to clear up much that formerly appeared obscure, and to show that even in the slighter forms and early

stages of gout, the renal organs become seriously implicated.

The so-called gouty kidney, such as occurs in advanced gout, and in chronic desquamative nephritis, has the following characters. It is usually much contracted, often not more than one-half or one-third the natural size, with a shrivelled appearance, the capsules thickened and opaque, and the surface granular. On section it is found that the decrease is chiefly at the expense of the cortical portion, which is sometimes so reduced that the pyramids almost reach the surface of the organ.

In 1849, when examining the kidney of a gouty man who had died from some other disease, I observed that not only had it the characters above described, but that white streaks existed chiefly in the direction of the tubes of the pyramidal portion, some, however, were found in the cortical part; the mamilla of each cone also presented the appearance of little white points, from deposition in this situation. Dr. Todd in his lecture on urinary diseases, mentions this fact, and gives an account of the post-mortem examination of a gouty patient who died from cholera, where the phenomenon was observed by Mr. Ceeley.

The external appearance presented by the kidney in this form of gout is exhibited in Plate 4, fig. 2 *a*, and the section of such a kidney is seen in the same figure, *b*, where the white points and lines are distinctly shown, as well as the contracted state of the organ.

When the white matter is placed under the microscope, it is found to be crystalline in structure, consisting of urate of soda in the form of prisms as represented in the accompanying woodcut. (Fig. 26). When the crystals are chemically tested, they are at once shown to consist of urate of soda, and to be identical with the matter which forms the essential part of chalk-stones, and produces the alteration in articular cartilages, as they are soluble to some extent in hot water, yield the murexide test when heated with nitric acid and ammonia, and afford crystalline rhombs of uric acid on the addition of a stronger acid.

Fig. 26.*

The phenomenon just alluded to, as well as the contracted state of the organ, I have now frequently observed—in fact in all cases of chronic chalk-gout where the opportunity of making an examination has been afforded, and of which many examples have been recorded in the last Chapter; it will there be seen that the kidneys have seldom been found to weigh more than $3\frac{1}{4}$, sometimes as little as $2\frac{1}{2}$ ounces.†

* Fig. 26 represents the crystals of urate of soda in the pyramidal portion of a gouty kidney. Linear magnifying power 220, and polarised light.

† The weight of the healthy kidney has been differently estimated

The contracted state of the kidneys in gout had been noticed long since, though no stress was laid upon the point until within the last few years. Mr. Henry Watson, in 1782, when describing the autopsy before referred to, speaks of the kidneys as small, and filled with hydatids (? cysts), and the outer surface of the right kidney covered with little bladders; in most of the early accounts of the post-mortem examinations of gouty subjects the condition of these organs is not mentioned.

Is not the same state of kidney found in other diseases besides gout? As far as the contracted or atrophied condition of the organ is concerned, the question must be answered in the affirmative, for this alteration is one which not unfrequently occurs in certain forms of albuminuria. A somewhat similar condition of urine is likewise found in many cases of granular disease and chronic desquamative nephritis, as in the severe forms of chalky gout, both as regards the ordinary physical qualities, as the low specific gravity, pale colour, and presence of albumen, and likewise as to the occurrence of granular and waxy casts, but I know of no published observations showing the presence of the white streaks of urate of soda in any other disease than gout. I have paid considerable attention to this point, and aided by Mr. W.

by observers. Some have considered that in the male the average is about $5\frac{1}{2}$ ounces, and in the female 5 ounces. Others think that $4\frac{1}{2}$ ounces is nearer the healthy average. The left kidney is generally somewhat heavier than the right.

Hickman, late physician's assistant in University College Hospital, obtained the results of an examination of these organs in twenty-three consecutive autopsies; the object of which was to ascertain if the white points and streaks were found in other than gouty cases. The examinations were necessarily made on subjects who had died of very varying causes, some from accidents, but most from disease; one individual had suffered from gout, and here the deposits were discovered, as also the affection of the joints; in nineteen out of twenty-two remaining cases, no deposits of urate of soda were discovered, but fatty matter was occasionally observed among the tubes; in three, however, in whose joints no evidence of gouty deposit was visible, crystals were seen in the kidneys, some composed of uric acid, others of urate of soda, but all of them situated within the tubes, and much larger than those observed in cases of gout, where, as I have before remarked, the deposit often appears to be interstitial, that is, within the fibrous tissues of the kidney, as if true gouty inflammation had occurred in the organ itself. I should not wish at present to make any positive statement on the subject, as I look upon it as still sub judice. Although crystalline deposits are found in other subjects than those who have had gout in their articulations, yet the occurrence is rare, and, besides this, the extent to which it occurs is generally so small as to require a special examination to discover it, whereas, in gouty cases, it is very apparent. Of the above three apparently exceptional cases, two were

males, 70 and 73 years old; the other a female, 68 years of age, who died from a burn.

Having noticed the constant occurrence of a morbid state of the kidney in advanced gout, and added, if such were necessary, additional proof to the correctness of the observations of Dr. Todd and others, it became a matter of much interest to proceed further with the inquiry, and ascertain whether in its slighter forms the kidneys were also implicated, as I had long been impressed with the conviction that an altered renal secretion was closely related to the disease.

In the account of Case 6, it will be observed that there existed, in a well marked form, the shrivelled condition of these organs, and a deposit of crystallised urate of soda in the direction of the tubules; points of the same were also seen at the apices of the cones. The microscopic structure was likewise altered in the manner shortly to be described. In this subject the only external evidence of gout was the presence of two or three small points upon the cartilage of one ear.

In Case 7 the kidneys were also considerably diseased, of small weight, much shrivelled in the cortical portion, and exhibiting the white points at the apices of the pyramids, and streaks of the same salt in the direction of the tubuli. Miscroscopically the structure was much altered.

In Case 8 the kidneys, although congested and weighing nearly six ounces each, were granular in

structure, and exhibited the same streaks and points as in Case 7.

The kidneys in Case 9 had undergone considerable change, did not exceed three ounces in weight, and contained much urate of soda about the ends of the pyramids, and in the direction of the tubes, which exhibited the usual microscopic appearance.

In Case 10 the renal organs were not examined; the allowed inspection being confined to one great toe.

In Case 11 the alteration in the kidneys was a subject of much interest, as only eight attacks of gout had occurred, and no visible sequelæ had been left by them. Here it will be observed the kidneys were apparently healthy, each weighed four ounces and a half, and the capsules peeled off without difficulty; but when closely inspected, white points were found upon the free ends of the pyramids, and streaks existed, as in the former cases. The microscope also revealed the commencement of other mischief; a portion sent to Dr. G. Johnson, who was unacquainted with the case, elicited the following remarks:—"The epithelium in some of the tubes is very granular, and there are a few denuded tubes; the chief change in the kidney is an excess of oil in the epithelium; the outline of the tubes is very dark, depending on an accumulation of small oil globules in the epithelial lining." The deposited urate of soda was very highly characteristic.

In Cases 12 and 13 the white streaks and points were observed as before.

The only gouty subjects examined in which the kidneys were not distinctly affected, were Cases 14, 15, and 16; in all of them, however, these organs were much congested, which would render it difficult to detect minute points or streaks, even if present.

When I first observed the white points and streaks upon the pyramidal portion of the kidney, I was inclined to consider the appearance due to the filling of the tubuli uriniferi, and this was evidently Mr. Ceeley's idea; subsequent examinations, however, have led me to form a different opinion; the crystals of urate of soda, which are commonly much larger than in cartilage or ligament, often seem to be imbedded in the fibrous structure itself, rather than within the cavities of the tubules. Further investigations on this point are still a desideratum.

The microscopic appearances of the kidney in this form of disease have been carefully examined by Dr. George Johnson, and fully described in his work. To this gentleman I am indebted for the loan of the slides from which the drawings exhibiting the morbid appearances of the kidney were made. The change in the early state of the disease, when the kidneys are still of their natural size and weight, and present to the eye nothing abnormal, appears to consist in an altered condition of the epithelial cells of the convoluted tubes, which become opaque and have an unusually fine granular appearance. Dr. Johnson states, that "in some tubes there is an appearance of entire cells having been shed, so as to fill the tubes and

render them opaque; while in others there is an equal filling and opacity of the tubes, from containing epithelium in a disintegrated condition, and which has become so either from the crumbling of the cells while they are still attached to the basement membrane, or from the disintegration of the epithelial cells which have accumulated in the tubes after being shed in an entire form by a process of desquamation." There is often besides this an excess of oil in the epithelium.

After a time the matter contained in the tubes becomes disintegrated, and gradually removed by the watery secretion from the Malpighian tufts, and when this is effected the basement membrane is seen to be left almost denuded, and from being partly concealed by the surrounding fibrous rings, gives to the section a somewhat vesicular appearance. The conditions just described are shown in Fig. 27, where the tubes which are filled with the disintegrated epithelial cells are seen to the right and below; whereas the denuded tubes giving rise to the cystic appearance occupy

Fig. 27.*

* Fig. 27 represents the condition of the kidney in gout and some forms of albuminuria (chronic desquamative nephritis). To the right and below the tubes are filled with disintegrated epithelial cells; the cystic appearance in the other parts is produced by the denuding of the tubes and removal of the epithelium. Linear magnifying power, 100.

the rest of the drawing. After a time, and as a result of the removal of the epithelium, the tubes gradually become wasted and shrivelled from the collapse of the surrounding tissue; by this change the Malpighian bodies approach each other, and hence appear more numerous than usual in the field of the microscope. This change I have observed in all the cases of advanced gout in which I have had an opportunity of examining the kidneys, and it is represented in Fig. 28, where the atrophied and shrivelled tubes may be observed to the right, and the Malpighian corpuscles to the left of the drawing.

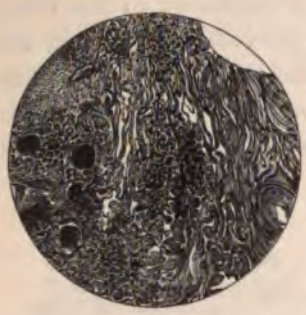


Fig. 28.*

During the time the above changes are taking place in the urinary tubes, the blood-vessels of the kidney are undergoing a marked alteration, and this is more especially seen in the Malpighian arteries and capillaries, the coats of which are much thickened or hypertrophied. Dr. Johnson says, that both the circular and longitudinal fibres become affected, but that the longitudinal are increased more than the other set, and hence, when diseased, become of about

* Fig. 28, from a section of a kidney in advanced gout, exhibiting, to the right, the tubes in an atrophied and shrivelled state, and to the left the clustering together of Malpighian bodies. Linear magnifying power, 100.

equal thickness. The smallest arteries, or the afferent vessels of the Malpighian tufts, are most implicated, and under the microscope exhibit the appearance in Fig. 29, where tortuosity is often combined with hypertrophy. Such a condition of the arteries is only seen when the substance of the organ is much altered, and the impediment to the circulation greatly increased.

Fig. 29.*

Little has been made out with regard to the state of the capillaries of the kidney, but they probably become wasted. The walls of the efferent vessels or veins are certainly not hypertrophied, but, like the capillaries, undergo a slow process of atrophy and contraction.

Deposition of Gouty matter in other Organs.— Gouty concretions or deposits have been said to occur not only in the structures we have already alluded to, but also in various other tissues and organs. Thus Rœring found concretions in the lungs of an old man who had suffered from the disease in question, but there is no reason to suppose that they were gouty in character, as they consisted of phosphate of lime,

* Fig. 29 represents the hypertrophy of the Malpighian arteries; the muscular fibres are seen to be much enlarged, more especially the circular, in the drawing. Some alteration of focus is required to bring the longitudinal set into view. Linear magnifying power, 100.

masses of which we know to be far from uncommon in such situations in patients who have never had gout. Landerer found a white deposit on the inner surface of the aorta of a gouty subject, but I am not aware that any chemical analysis of it was made.

I have carefully examined the deposits found on the valves of the heart and the atheroma from the aorta of several gouty patients, having extensive chalk-stones, but have always failed to discover the least trace of uric acid; but tabular crystals of cholesterine are often present in such matter.

Deposits are stated to have been found in the meninges of the brain of gouty subjects, and Schonlein is said to have detected urates in them; there is no doubt but that they generally consist of phosphate and carbonate of lime, and probably have no relation whatever to the disease under consideration. It may be remembered that Mr. H. Watson, in his description of the appearances presented by his gouty patient, mentions that on the outer surface of the pia mater there was a cream or smooth chalk-like mucus. At the time he published his examination, nothing was known of the chemical nature of gouty deposits: their physical characters only were regarded. In many other observations, the error has frequently been committed of looking upon all the morbid alterations found in the subjects as necessarily connected with gout, whereas they may not be in the most remote degree allied to this disease.

In one case of very severe gout, (Case 3, Chapter

VI.), I have observed some points of deposit on the arytenoid cartilages, and these were proved to consist of urate of soda, both from their microscopic and chemical characters.

CHAPTER VIII.

CAUSES OF GOUT:—PREDISPOSING CAUSES: HEREDITARY INFLUENCE—SEX—AGE—TEMPERAMENT OR CONSTITUTIONAL PECULIARITY—ALCOHOLIC LIQUORS—DIFFERENCES IN THEIR POWER OF INDUCING GOUT—INDIGESTION—ANIMAL DIET—ABSENCE OF EXERCISE—SEVERE STUDY—MENTAL ANXIETY—CLIMATE—LEAD AS A PREDISPOSING CAUSE OF GOUT—GREAT FREQUENCY OF THE DISEASE AMONG PAINTERS AND PLUMBERS—INFLUENCE OF THE ABSORPTION OF LEAD UPON THE EXCRETION OF URIC ACID—EXCITING CAUSES: WINES, &C.—DYSPEPSIA—COLD AND MOISTURE—MENTAL AND BODILY EXCITEMENT OR FATIGUE.

THE most casual observer must at once perceive that there is a great difference among individuals in their liability to gout: some are born with a well-marked predisposition to the disease; others, by the nature of their occupations or habits, acquire it; at some ages it is frequent, at others it is rarely met with; some causes act slowly, requiring months or even years to develop the affection; other influences, although powerless in inducing the disease, may in some rapidly bring on an attack. The causes of gout may therefore be conveniently divided into two classes, predisposing and exciting.

1. *Predisposing Causes of Gout.*—Of these, some manifestly depend on constitutional peculiarity and are inherent in the individual; others are from without, and are produced by external influences.

Influence of Hereditary Predisposition on the Occurrence of Gout.—Most writers acknowledge this influence to be very potent, some have even gone the length of considering gout purely hereditary; such was the opinion of Dr. Cullen; but that it often is acquired, we can bring forward abundant evidence to prove.

Sir C. Scudamore found that in 523 gouty patients, as many as 309 could trace a predisposition to the disease either from their parents or grand-parents. And from the results arrived at by a Commission of the French Academy, the strong influence of hereditary predisposition is shown, though in a less marked degree than in Sir C. Scudamore's cases. Of eighty patients suffering from acute or chronic gout, thirty-four attributed the disease to its influence, and in forty-six, the malady seemed to have been acquired. Among my hospital gouty patients, 50 per cent. could establish an hereditary predisposition to the disease, but when the cases of gout which have occurred in private practice are included, a still higher per centage is obtained.

On the other hand, experience has convinced me that gout is frequently acquired in this country, even at an early age, and in many of the most inveterate cases I have met with, the patients could not trace the affection, in the most remote degree, to hereditary influence. Heberden also relates an instance of a female who suffered from gout to such a degree as to have numerous sores from chalk-stones, and yet the

disease had never been heard of among her relations, and several cases of a similar kind have come under my own observation. One patient, a female only thirty-nine years of age, who suffered most severely from chalk stones, could trace no predisposition in any member of her family; and another female, even more crippled, could only ascribe the disease to the port wine she had been in the habit of drinking. All evidence on this subject appears to point to the fact that the children of gouty parents are, *cæteris paribus*, more liable to gout than those who have no such descent.

A few years since, I was consulted by a gentleman labouring under a severe form of gout with chalk-stones, and, although not more than fifty years old, he had suffered from the disease for a long period. On inquiry I ascertained that for upwards of four centuries the eldest son of the family had invariably been afflicted with gout when he came into possession of the family estate.

It would be needless to dilate further on this subject, as all who have had an opportunity of becoming conversant with the history of this malady must be fully convinced that hereditary predisposition plays no unimportant part in its development.

It is a common opinion, and one with which from my own experience I should be inclined to agree, that the gout appears earlier in life when hereditary predisposition exists, than when it is acquired. Sir C. Scudamore once held the same view, but afterwards found

that, on putting the question to the test by the examination of 214 persons who had gout in a very severe degree, he arrived at the conclusion, that although the influence of hereditary predisposition was well marked in causing the appearance of the disease at an earlier period of life, still that it was by no means so strongly shown as he had previously supposed. Thus, out of the 214 cases above alluded to, 124 were hereditary and ninety acquired; of the hereditary there were eight men and two women before the age of twenty, fifty men and six women between the ages of twenty and thirty, and fifty men and eight women between the ages of thirty and forty.

Although I have seen many patients suffering from gout in early life who could not trace the disease in any branch of their families, these cases have been all satisfactorily explained by the habits of life, and I do not remember a single instance of its occurrence in youth which could not be thus accounted for.

Influence of Sex upon the Occurrence of Gout.—That women are less subject to gout than men is beyond doubt; at the same time the aphorism of Hippocrates, "Mulier podagrâ non laborat nisi ipsi menstrua defecerint," although possibly correct at the time it was written, certainly does not hold good at present; but even at the present time, gout in its regular and developed form is comparatively rare among females. The reason of this immunity enjoyed by the female sex will not be difficult to understand, when we have

discussed the predisposing and exciting causes which most powerfully tend to its development; for we shall find that the female sex, from the different character of their habits, are much less exposed to these influences; besides which, a most powerful counteracting influence exists in the presence of the catamenia, during a considerable portion of their lives; sometimes, however, women, although quite regular as to this discharge, are subject to genuine gout. I have seen several patients so affected, and have likewise been called in to attend cases where, at the time of pregnancy, the great toe and other joints have been severely attacked.

Most of the female cases which have come under my notice have been inherited, and I believe that in this country acquired gout is rare in women. In the degenerate times of the Roman empire, when they gave themselves up to every kind of licentiousness, they appear, from Seneca's account, to have become the subjects of gout equally with men.

In women gout is more prone to assume an asthenic form, and to exhibit its masked and irregular manifestations, and it is also liable to appear shortly after the cessation of the menstrual discharge.

In the French table before referred to, in 80 cases of gout, 78 of the patients were men, and 2 only women, and my own experience quite accords with these results. The influence of sex on the occurrence of gout is so great that it becomes a diagnostic mark between gout and rheumatism, for the latter

disease is perhaps more frequent among women than men.

Influence of Age upon the Occurrence of Gout.—Youth, for the most part, enjoys immunity from gout. Hippocrates expressed his opinion on this subject in the following aphorism:—"Puer podagrâ non laborat, ante veneris usum;" and Sydenham states that he had never seen either gouty minors or children; the most that he had observed was the slight foreshadowing of a future attack in the younger branches of gouty families. Heberden, again, never knew a certain case of gout before the age of puberty. On the other hand, instances are related in which gout is said to have occurred in very young children, but I am of opinion that in many of these cases considerable doubt may be entertained as to the correctness of the diagnosis, for in "young" subjects other joint affections, especially rheumatism, may readily be mistaken for gout.

The period of the first attack was noted by Sir C. Scudamore in 515 cases, and the results of his inquiry are seen below:—

At the age of eight	1
,, twelve	1
,, fifteen	1
,, sixteen	1
,, seventeen	1
,, eighteen	5
,, nineteen	3
Between twenty and twenty-five years of age	57
,, twenty-five and thirty ,,	85

Between	thirty and thirty-five years of age	105
,,	thirty-five and forty ,,	89
,,	forty and forty-five ,,	64
,,	forty-five and fifty ,,	54
,,	fifty and fifty-five ,,	26
,,	fifty-five and sixty ,,	12
,,	sixty and sixty-five ,,	8
At the age of sixty-six		2
		515

Sir C. Scudamore, in alluding to the above table, remarked that he had not himself witnessed many examples of a first attack of gout before twenty, nor any after sixty-six.

It will be observed from the above, that in adult age, after the growth of the body is complete, and before the powers begin to decline, in by far the majority of cases, gout makes its appearance; when the age is measured by decennial periods, the greater number of cases are found to occur between the thirtieth and fortieth year.

Some years since I was called upon to treat a first and only attack of the disease, in a gentleman at the age of seventy. The patient was suffering from valvular disease of the heart, with dyspnœa and anasarca of much severity. Early one morning, and at a time when there was scarcely any anasarca, the ball of the left great toe became hot, swollen, and painful; after a few days the fit passed off in the usual manner, and was succeeded by desquamation of the cuticle. During the time the gouty symptoms

were present, marked relief in the breathing was experienced.

Within the last two years I have known several cases in which the first attack occurred after seventy years of age, and Sir R. Blackmore relates an instance of a gentleman of vigorous constitution, in whom gout occurred for the first time at the advanced age of seventy-eight.

A short time since I was consulted by a young gentleman, only seventeen years of age, just recovering from a second attack of gout in the left great toe; his first fit had occurred about twelve months previously, and had affected the same joint. In this instance the influence of hereditary predisposition was very strong, both father and mother and many members of his family on each side having suffered from the malady.

Several patients have recently informed me that they had experienced distinct attacks of gout at very early ages, when they were pupils at the public schools; one gentleman, now a severe sufferer from gout, assures me his first attack occurred at nine, his second at twelve years of age.

Patients who inherit gout suffer from its attacks at an earlier age than when it is simply acquired; for example, in the French table previously referred to, the mean age of the thirty-four cases of hereditary gout was thirty-four years, the extremes being thirteen and sixty years: whereas in forty-three out of the forty-six cases of the acquired disease, where the

age is noted, the mean is thirty-eight years, the extremes being twenty-seven and fifty; my own experience fully confirms this.

Between genuine gout and rheumatism, as typified in cases of rheumatic fever, a marked distinction is seen in the influence of age; the former occurs most commonly for the first time after thirty-five, the latter is seldom met with when that period of life is passed.

Influence of Temperament or Constitutional Peculiarity on the development of Gout.—It must be remembered that the ancients, from the time of Hippocrates, held the opinion that there existed four kinds of humours in the human body,—blood, bile, black-bile, and phlegm, and that, as one or other of such humours was supposed to be present in excess, the individual was said to be of a sanguineous, bilious, melancholic, or phlegmatic temperament. These terms, though still employed in medicine, are used with little precision, and much reliance cannot be placed upon the indications they are supposed to give. The term "nervous temperament" is also occasionally employed, and by it a peculiar irritable condition of the nervous system is understood.

With regard to the influence of the so-called temperament upon the occurrence of gout, I have little information to offer, having derived nothing satisfactory from my own observation, and having met with the disease in individuals presenting every variety of

bodily conformation. In general terms it may be said that acute sthenic gout occurs most frequently in subjects of a sanguine temperament, and those inclined to corpulency; whereas the asthenic and irregular forms are usually seen in individuals of the nervous temperament and spare habit of body.

Dr. Cullen made the following observations on the influence of temperament:—"If, with the ancients, we might ascertain by certain terms the temperaments of men, I could say that the gout attacks especially men of a choleric-sanguine temperament, and that it seldom attacks the pure sanguine or melancholic. It is, however, very difficult to treat this matter with due precision." And in another place he says, "It attacks especially men of robust and large bodies, men of large heads, and of full and corpulent habits, and men whose skins are covered with a thick rete mucosum, which gives a coarser surface."

Influence of fermented and distilled liquors in inducing Gout.—There is no truth in medicine better established than the fact that the use of fermented liquors is the most powerful of all the predisposing causes of gout; nay, so powerful, that it may be a question whether gout would ever have been known to mankind had such beverages not been indulged in.

A considerable difference, however, exists between the various fermented liquors in their power of inducing gout, and many interesting observations and facts can be elicited in relation to this point.

On the first consideration of the question, it would be natural to suppose that, as the great peculiarity of all fermented liquors consists in the alcohol they contain, their power of causing gout would be in proportion to the quantity of spirit in their composition, but a more careful investigation of the subject fails to establish this supposition. Distilled spirits, when exclusively taken, appear to exert little or no power in inducing gout; whereas wines, strong ales, and porter, are potent agents, a fact which is forcibly impressed on the mind on taking a review of the prevalence of the disease in different countries and among different classes of individuals. In Scotland gout is much less frequently met with than in England, and I have been assured by physicans of note in that country that they very seldom see a case, and when it does occur it is generally in the upper classes of society and in large cities, where wines and ales have been largely substituted for whiskey. Dr. Gregory, at the Royal Infirmary of Edinburgh, had only two cases of gout in two thousand two hundred clinical patients admitted under his care, and Dr. Hamilton, during nearly thirty years, had likewise but two such patients. Dr. Christison bears similar testimony, for he informs me that he only met with two cases of gout in the same infirmary, although physician to it for thirty years, and both the subjects were fat and overfed English butlers. The same freedom from gout is equally enjoyed in other Scotch cities, as Glasgow and Aberdeen, as likewise in Ireland, where whiskey is the principal beverage; and

Russians, Poles, and Danes, who usually drink distilled spirits, also enjoy comparative immunity from gout.

Van Swieten states that in Holland gout was but little known until wine was introduced as a substitute for beer; and Linnæus, from his observation upon the habits of the Laplanders, was inclined to regard wine as almost the sole producer of gout, as the people partook of malt liquors with impunity.

These statements of Van Swieten and Linnæus merely render it probable that wine is more powerful in producing gout than the beer drank in those countries; we shall soon have occasion to show that malt liquors, more especially the stronger varieties, are most potent predisposing agents.

Many facts are on record showing the relative powers possessed by spirits, wines, and malt liquors, in this respect. Sir C. Scudamore gives an account of two patients illustrating the point. The first, that of a strong and corpulent man, about 34 years of age, who had been subject to gout for five years. In the earlier part of his life he had been constantly on the sea coast as a smuggler, and had drunk two or three pints of Hollands a day; this was continued during a period of four or five years, simply with the effect of making him somewhat nervous and dyspeptic. He afterwards became a bricklayer, and being possessed of property, indulged both in wine and porter, taking only a small quantity of spirits; in two years after he had commenced this new mode of living he was attacked with gout.

In the second instance the patient lived in the country until he was 28 years of age, and partook freely of Hollands. He then engaged himself as a butler in London, and indulged freely in wine and malt liquors. When he came under treatment he was 59 years of age, and during the last 24 years had had an annual attack of gout. In neither of the above mentioned cases did the slightest hereditary predisposition exist.

Against the deductions which might be drawn from these two cases, it may fairly be urged that, with the change from spirits to malt liquors or wine, there was likewise considerable alteration in habits and occupations, and that the patients were approaching the age at which gout commonly manifests itself.

A striking example, illustrating the same fact, has been recorded by Dr. William Budd, who states that, "There is a body of men employed in the Thames, whose occupation it is to raise ballast from the bottom of the river; as this can only be done when the tide is ebbing, their hours of labour are regulated by this circumstance, and vary through every period of night and day. They work under much exposure to inclemencies of weather; their occupation requires great bodily exertion, occasioning profuse sweating and exhaustion. In consideration of this, their allowance of liquor is very large; each man drinks from two to three gallons of porter daily, and generally a considerable quantity of spirits besides. This immoderate consumption of liquors forms the only exception, as far

as relates to food, which these men offer to the general habits of the lower classes, and, although not a numerous body, many of them are yearly admitted to the Seamen's Hospital Ship affected with that disease (gout). This is a very interesting fact, and seems to show that no amount of bodily exertion is adequate to counteract the influences of such large doses of porter; the exposure of ballasters to wet and moisture seems to favour its operation. These men are almost all derived from the peasantry of Ireland, they can rarely therefore inherit a disposition to gout."

My own experience of the relative power of alcoholic liquors in inducing gout, may be thus stated: the wines ordinarily drank in this country, as port, sherry, and other stronger varieties are most potent in their operation; but the fact must not be lost sight of, that those who are in the habit of drinking wine, are, at the same time, able to procure other delicacies, and especially the luxuries of the table, additional circumstances greatly favouring the development of the disease. A few years' liberal indulgence in port or sherry wine will often of itself produce gout, when no hereditary tendency exists; and even among the labouring classes this fact may be occasionally observed, when, from the peculiar nature of their occupations—cellarmen, bottlers, &c.—men have opportunity of taking wine in considerable quantities.

The lighter wines, as claret, hock, moselle, and champagne, although capable of acting as the exciting

cause of an attack in gouty subjects, have, when taken in moderation, but comparatively little inducing power, and in this respect rank with the weaker kinds of malt liquors. The wine-drinking population of France and Rhenish Germany are but little afflicted with gout, and the same holds good with our own agriculturists; but when the finer qualities of these wines are freely partaken of, especially if combined with excess of animal food, gout is by no means tardy in manifesting itself. In some of the larger cities of France and Germany gout is common, although considerably less so than in England, and in Bavaria and Berlin, where a large amount of beer is drank, gout also prevails.

Stout and porter rank next to wine as predisposing causes, and some of the most severe and inveterate forms of gout I have met with in hospital practice have been in patients who had thus acquired the disorder; such, for example, are the cases occurring among the men connected with the great London breweries, who not unfrequently drink an almost fabulous quantity of malt liquor. I have notes of the case of a man, 28 years of age, suffering from a severe form of the disease, attended with a deep-seated gouty abscess in the foot, who assured me that he had seldom taken less than three gallons of porter during the day, often more.

Strong ales, and even the ordinary bitter beers, so commonly used at the present day, exert a similar influence, as exemplified in the following instance. A

patient only 30 years of age, connected with a pale-ale brewery, consulted me a few years ago; he had had his first attack of gout four years previously, at the age of 26; it was slight, and confined to the ball of the right great toe; three years afterwards he suffered from a severe fit of the disease, implicating not only the toe but the ankle, heel, and knee; during the twelvemonth previous to my seeing him, the attacks had been frequent, about every three months, and were assuming a chronic form. In this case no hereditary tendency could be discovered in any branch of the family, although carefully sought for, and the disease appeared to have been induced simply by the habit of repeatedly drinking pale ale in small quantities at a time, although the total amount in the day was considerable.

Cider and similar beverages act to some extent as predisposing causes of gout, although probably a much larger quantity of them is required than of the stronger kinds of malt liquors. In Devonshire and Herefordshire gout, as far as my own experience enables me to judge, is by no means infrequent. Dr. Wood remarks that, as a *predisposing* cause, cider cannot be very potent, otherwise gout would have been more prevalent among the people of New England, and the middle Atlantic States, where this drink was very commonly employed. Of the power of cider in *exciting* a gouty paroxysm there can be no question.

Having fully determined the fact that the various alcoholic liquors possess different degrees of potency

in causing the development of gout, it next becomes interesting to inquire the reason of such difference.

Why are distilled spirits less prone to induce gout than those which have simply undergone the process of fermentation? Their influence certainly bears no direct ratio to the amount of alcohol contained in them; for the same quantity of spirit which in the form of port wine is capable of developing the disorder, is completely powerless if taken in the form of whisky; and the same holds good when the comparison is made between strong malt liquors and spirits.

Is there any known difference in their composition to account for this?

Distilled liquors, as brandy, hollands, whisky, gin, and rum, contain alcohol and water, sometimes united with small amounts of colouring substances and other matters to which their peculiar aroma and taste are due; the amount of absolute spirit varying in the different varieties from 40 to 70 per cent.

Wines, on the other hand, beside spirit and water, contain sugar, gum, extractive and albuminous matters, certain free acids, as tartaric, racemic, malic, and acetic, tartrates of potash, lime and magnesia, sulphate of magnesia, common salt, and traces of phosphate of lime; in addition to these, especially in the cellared wines, the organic compounds which impart aroma, as œnanthic, acetic and other ethers. In some, tannic acid and colouring substances are also found.

As the nature and amount of these different principles are liable to considerable variation, some arrange-

ment in groups may be advantageously adopted. They are thus classified by Mulder:—

1. Sweet, or liqueur wines, as Malaga, Tokay and Madeira; some of these are rich in sugar, but Madeira contains no excess of this principle.
2. Acid, or harsh wines, rich in tartaric acid, but poor in sugar, including the Rhine wines (Hocks), and Moselle.
3. Spirituous wines; as Port, Burgundy, and Sherry.
4. Wines containing tannic acid, including most of the French wines (Clarets), and resembling some in No. 3, with the exception of containing less alcohol.
5. Effervescing wines; as Champagne.

As far as the quantity of alcohol is concerned,—

Port wines . .	average of	11	kinds =	19·3 per cent.
Madeira . . .	,,	12	,, =	19·1 ,,
Teneriffe . . .	,,	12	,, =	18·8 ,,
Rhine wines . .	,,	11	,, =	10·6 ,,

The amount of alcohol in Port wines varies from 17 to 21 per cent.; in Madeira the quantity is much the same; in Sauterne it varies from 12 to 15 per cent. In red French wines, from 9 to 14 per cent.; in good Bordeaux, 10, 11, and 12 per cent.; in Burgundy, 9, 10, and 11 per cent.; in Champagne, 10 and 11 per cent. In Rhine wines, 6 to 12 per cent., generally from 9 to 10 per cent.

As regards acidity, Dr. Bence Jones has ascertained that wines may be arranged in the following order,

beginning with the least acid:—Sherry, Port, Champagne, Claret, Madeira, Burgundy, Rhine wines, and Moselle. The least acid of all alcoholic fluids are Geneva and Whisky, then Rum and Brandy, afterwards Ale, Porter, and Stout. All the wines are found to be more acid than malt liquors.

The following was ascertained to be the order when measured by the amount of saccharine matter, beginning with the least sweet:—Geneva, Rum, Whisky, Claret, Burgundy, Rhine wines, and Moselle, have no sugar; then Brandy, Sherry, Madeira, Champagne, Port wine, Cider, Porter, Stout, Malmsey, Ale, Tokay, Samos, Paxarete and Cyprus.

Does our present knowledge of the relative composition of the different kinds of alcoholic liquors throw any light upon their varying powers of inducing gout? So much, at least, is proved, namely, that it is not simply the amount of *alcohol* in the fluid, which determines the result, for we have shown that whisky and other distilled spirits have little power; at the same time it will be observed that the wines richest in spirit are usually the most potent predisposers to the disease, as illustrated in the case of Port.

The presence of *acidity* in alcoholic fluids cannot be looked upon as having much influence, seeing that Port and Sherry are among the least acid wines, and that strong malt liquors, usually freer from acidity than wines, are powerful predisposing agents; on the other hand, the more acid wines, as Clarets and Hock, are comparatively harmless in this respect; in ex-

citing a paroxysm of gout, it is probable that the amount of acidity is of much moment.

The quantity of *sugar* can hardly be considered to exercise much effect, for it exists in large quantities in some of the most potent gout-inducing liquors, in small amounts in others, and certainly no direct ratio can be established between the presence of saccharine matter and the predisposing power of any alcoholic beverage.

But little is known respecting the *saline matters* of wines and other liquors; it is probable that the alkaline salts, especially those of potash, more abundant in the lighter wines, and which produce diuresis, may in some way lessen their injurious effects.

From our present state of knowledge the following are the only conclusions which can be safely drawn in reference to this subject:—

1. Diluted alcohol, in the form of distilled spirits, has little power in causing gout, at least in those who are not predisposed to it.

2. Alcohol when in combination with other substances, as in wines and malt liquors, becomes a potent cause of gout, and the greater the amount of contained spirit in such beverages, the more powerful their influence in producing the disease.

3. Neither the acid, sugar, nor any known principle contained in these liquors, can as yet be proved to impart to the alcohol its predisposing influence; for wines the least acid, and liquors the least sweet, are often among the most baneful.

To which we may add, with some probability of truth:

4. Alcoholic fluids which have little tendency to cause dyspepsia, and those which act more especially as diuretics, can, as far as gout is concerned, be taken with greater impunity than beverages of an opposite character.

It must be borne in mind that our remarks with regard to distilled spirits apply simply to their little influence in the production of gout, and it must not for a moment be supposed that these liquors are less pernicious in other respects than wines; on the contrary, the occurrence of granular kidney and dropsy is exceedingly common among populations who drink them largely.

Indigestion, animal diet and absence of exercise.—It is often a task of much difficulty to separate the effects of the above-named influences, as dyspepsia is commonly induced by taking too much food, and it may be equally caused by a want of sufficient bodily exercise. Cullen remarked that gout seldom attacked persons employed in constant bodily labour, or those who live much upon vegetable diet, and few would feel disposed to differ from him in the general truth of the statement, for it is rare to find gout among a rural population, where much toil is endured, and where meat forms a comparatively small proportion of the diet; on the other hand, its occurrence is frequent among those who freely partake of highly seasoned dishes, and who are in the habit of consuming a quan-

tity of nutriment far above the requirements of the system. This may be accounted for by the fact that an excess of food, more especially when highly nitrogenised, favours an increased formation of uric acid, which has already been shown to bear a close relation to the development of gout.

Not only does an undue amount of food predispose to gout, but the manner in which it is assimilated has also an influence: when the digestive function is imperfectly performed, the disease is more apt to become developed. Sydenham from his own experience came to the conclusion that gout arises from what he termed a weakened concoction both of the solids and fluids, and although we have brought forward evidence to show that defective excretion plays an important part in its production, we must not lose sight of the very powerful influence of imperfect digestion and assimilation.

It is a matter of interest to inquire what are the varieties of dyspepsia which, by long continuance, give rise to the gouty diathesis and the development of the local affection. I believe the answer to be simple. Many of the forms of atonic indigestion are almost inoperative in this respect, as they merely prevent the proper formation of chyme, and hence only impair the general nutrition of the body; but those varieties of dyspepsia which lead to the excessive formation of uric acid in the system, tend powerfully to the production of gout. Clinical observation has convinced me of the truth of this statement, for I find

that in some forms of dyspepsia, the formation of uric acid is even below the healthy standard, but in other forms the amount is greatly augmented; it is in the latter varieties only that we can anticipate the development of the disease, and these are generally accompanied with sluggish circulation in the portal system and congested liver.

It must be borne in mind that in gouty cases, especially where many attacks have already occurred, little can be determined with regard to the nature of the dyspepsia which laid the foundation of the disease; for as mal-assimilation may lead to the production of uric acid, so an excess of uric acid circulating in the blood may itself give rise to a secondary form of dyspepsia, and cause many of the premonitory symptoms referable to the digestive organs, so commonly met with in gouty subjects.

The more prominent symptoms of the dyspepsia connected with the uric acid diathesis may be thus summed up: heartburn and eructations, oppression, and frequently sleepiness after food; a feeling of distension in the epigastrium, at times accompanied with tenderness; some fulness over the hepatic region, and the edge of the liver projecting a little below the ribs, and occasionally tender to the touch; the tongue much furred, red at the tip and edges, a disagreeable and clammy taste in the mouth, and the saliva and buccal secretion often more adhesive than natural. The bowels are usually confined, scybalous, sometimes very dark in appearance, at other times light and clay-

coloured, showing a defective excretion of biliary matter. Accompanying these symptoms there is a scanty secretion of urine, which is high coloured and acid, and gives rise on cooling to a copious deposit of urates, or to a sediment of crystallised uric acid, varying from a brick-dust red to a pale yellow.

Influence of severe study and mental anxiety, &c., &c. —That the condition of the mind has a powerful influence upon the manner in which the functions of the various organs of the body are performed, is at once rendered evident by watching its effect upon the digestive and renal organs. It is not uncommon to find that a severe fit of indigestion immediately follows the receipt of painful intelligence, and most people are cognisant of the intimate relation existing between the state of the mind and the secretion of the kidneys. As powerful and sudden influences rapidly effect appreciable changes in the different functions, so those less marked act as surely, though imperceptibly for the time, in altering the general nutritive processes of the body, and in the end produce great and lasting mischief. Severe and prolonged study, which is almost necessarily conjoined with a sedentary life, tends greatly to lower the tone of the excretory organs, especially of the kidneys, at the same time that it impairs the powers of digestion; hence ensues not only a defective excretion of some of the principles of the urine, but likewise their increased formation, circumstances which powerfully engender an impure

condition of the blood. There are many cases on record, among men eminent for their talents and application, which could be brought forward in proof of the influence of mental labour in causing the development of gout, and likewise in exciting its attacks; but it will suffice to quote the words of Sydenham in his letter to Dr. Short, in which he says, "I send you a short tract upon Gout and Dropsy, instead of the thicker volume, which in my own mind I had determined on, viz., a history of such chronic diseases as my practice has most especially met with. By applying my mind, however, to its utmost, and by bringing all my powers of thought on the subject, I brought on a fit of gout, such as I had never before suffered from; so that the fact itself warned me to lay aside, even against my own will, such lucubrations, and to take care of myself; well satisfied with having, in some measure, dealt with these two diseases. Whenever I returned to my studies, gout returned to me."

In another part of the same treatise the author states that more wise men than fools suffer from gout, and from this and like evidence but one opinion can be arrived at as to the influence of severe and protracted mental exertion on the development of the disease; at the same time I believe that such cause alone would be inoperative, unless aided by hereditary predisposition. In relation to this subject, Sir C. Scudamore remarks, that "the late Mr. Pitt and his father suffered from gout at an early period of life. The

father was a votary to Bacchus; of the son this could not strictly be said: but both were ardent students." It is also a well-known fact, that in this country at least, cabinet ministers and politicians most distinguished by their talents and assiduous application, are frequently severe martyrs to the disease.

Other powerfully depressing influences, as sorrow and chagrin, act in engendering a gouty habit; thus, reverses of fortune have been known to do so, although usually accompanied by circumstances which might be supposed to prevent its development; the same has been asserted of other mental emotions.

The influence of venereal excesses in the production of gout was much insisted upon by early authors. Hippocrates' aphorism relating to this point is only partially true; were it literally correct, eunuchs should be altogether free, but Galen assures us that in the time of the Roman empire they enjoyed no exemption. Venereal excess, like all other depressing agencies, lowers the function of the nervous system, and hence favours the production of the malady; but its real influence is the more difficult to separate and define, inasmuch as it is frequently associated with immoderate indulgence in alcoholic liquors; hence the lines of the Greek poet in which Gout is described as the daughter of Bacchus and Venus.

Λυσιμελους Βάκχου, και λυσιμελους Αφροδίτης
Γέναται θυγάτηρ, λυσιμελὴς Ποδάγρα.

In the treatment of the chronic forms of gout it is

of much importance that the effects of these various depressing causes should not be lost sight of.

Influence of climate and season.—It is a very difficult task to investigate accurately the real effect of climate upon the development of gout, for so many other influences are connected with climate, that the separation of one from another is rendered almost impossible. There are, however, certain facts which appear to be well established in relation to this subject, of much interest, and not devoid of importance.

Gout is undoubtedly much less prevalent in hot, than in temperate climates. Among the natives in the interior of Africa, we are told by Dr. Livingstone, that this disease, as well as calculus, is unknown, and I am informed that gout is not prevalent in the East Indies, except among European residents who have acquired it elsewhere; the same remark applies to the natives of other tropical climates, for in Turkey, China, and Japan, the disease is scarcely known, and in Italy it is much less frequent than in France or England.

It would, nevertheless, be dangerous from these facts to draw the inference that this immunity is due to the effect of climate, for the inhabitants of these warm countries are often free from many of the other predisposing causes of gout; for example, they seldom partake of alcoholic liquors, and their food contains less of nitrogen than that of nations in which gout is preva-

lent. We have also proof that other circumstances influence the development of gout more than mere climate, in the fact that in Rome, under the Republican form of government, the disorder was little known, but under the Empire, when luxury and indolence prevailed, it became extremely common, even among females. We have already had occasion to allude to the circumstance of the disease being rare among certain other nations, as the Scotch, Irish, Russians, and Poles; but we found good reason to ascribe the immunity which the people of these countries enjoy, rather to their abstaining from strong wines and malt liquors, than to any effect peculiar to their climate.

The influence of season in determining the time of an attack of gout, is often well shown in the earlier stages of the disorder, when the intervals between the fits are considerable. That the disease is most apt to occur in the spring and autumn is a fact known from the earliest antiquity; as Hippocrates remarks, in one of his aphorisms, "Podagrici affectus vere et autumno plerumque moventur." Galen also affirms that spring is the season when the return of gout is to be expected, and Sydenham considered that about the end of January, or beginning of February, the disease usually breaks out.

The examination of a large number of gouty patients with reference to the time of year at which the first attack of the disease manifested itself, has fully satisfied me that the opinion of the ancients is

correct. I have usually found that not only the first, but several of the early attacks, for the most part of annual occurrence, take place in the spring; after a time an autumnal fit is added, but when the disease has become engrafted into the system, the returns may be more frequent and at less regular intervals.

As a rule, even those who suffer from the more chronic forms of gout, are comparatively free during the hot months of summer, though occasionally well marked exceptions are found, and I have seen patients who suffer even more in summer than at any other time of the year.

Influence of Lead as a predisposing cause of Gout.—It is a well-established fact that metallic impregnation is capable of inducing pains in the extremities which bear a close resemblance to those of rheumatism; artificers exposed to mercurial vapours often suffer from what is termed "neuralgia mercurialis," and plumbers and painters are afflicted with somewhat similar pains, which have been designated "lead arthralgia, or metallic rheumatism" by Sauvages. The peculiarities of the latter affection consist in the pain being severe, and following to some extent the direction of the large nerves, and not being accompanied with tenderness, redness, or swelling.

The relation between lead impregnation and gout was not, I believe, made publicly known before 1854, when, in a paper read before the Medico-Chirurgical Society, and afterwards published in the Transac-

tions,* I alluded to the curious fact that a very large proportion, at least one in four, of the gouty patients who had come under my care in University College Hospital, had at some period of their lives been affected with lead poisoning, and for the most part followed the occupation of plumbers and painters. Since that date I have kept the subject prominently before my mind, and subsequent experience has fully confirmed the correctness of my original statement. I have also ascertained, from repeated inquiries of the masters and men engaged in the above trades, that gout is much more prevalent among painters than other workmen earning similar wages. There appears to be nothing in the habits of these men to account for their peculiar liability to gout, with the exception of their exposure to the influence of lead. Dr. Burrowes, from his experience at St. Bartholomew's, is convinced of the truth of the above statement, and other physicians have testified to the same.

On reference to my case-books I find that fifty-one male subjects of gout have been under my care in the hospital since the publication of the communication in the "Transactions" above referred to; of these as many as sixteen were painters, plumbers, or workers in lead: these numbers do not include patients with lead poisoning admitted into the wards, many of whom had been affected with gout.

Some questions of interest in connection with this subject immediately suggest themselves to the mind.

* Medico-Chirurgical Transactions, vol. xxxvi., for 1853.

Can lead impregnation induce gout without the co-operative aid of other predisposing causes? Granting the powerful influence of this cause, in what manner does it act in producing such result?

I am not prepared to answer the first question in the affirmative, but at present should hesitate to assert that the metal cannot of itself occasionally lead to the development of gout. It would be interesting to ascertain whether in countries where gout is uncommon among the working classes, as in France and Scotland, painters and plumbers are sufferers from the disease. Tanquerel des Planches, in his "Traité des Maladies de Plomb," although he gives an account of a great number of patients who suffered from lead-poisoning in its different varieties, does not allude to any of them having had gout. Through the kindness of Dr. Christison I am enabled to give the results of that gentleman's valuable experience. In answer to some inquiries in 1859, Dr. Christison remarked as follows: "I am unable to supply you, from Edinburgh experience, with any information relative to the question, whether gout is apt to occur among those who are liable to suffer from exposure to the deleterious influence of lead. Poisoning from protracted exposure to lead is a very rare occurrence in Edinburgh. When I first became acquainted with the diseases of the working classes here, namely, in 1817, as clinical clerk, a few characteristic cases of lead-colic and palsy were annually admitted into the infirmary from a whitelead manufactory carried on according to the

old process at Portobello, a village three miles off. In a few years this source of supply ceased, in consequence of the owner of the works adopting the method of separating the white lead from the metallic plates, and subsequently grinding it under water. Not many years after that change, indeed, the manufactory was given up. Although I have been physician of the hospital from 1827 until two years ago, I have not seen a single case of lead-colic or ordinary lead-palsy during all the intervening period. I can recollect two cases of wrist-drop in compositors, that is all. Among house-painters and plumbers, both of them numerous here, as they work extensively in the country around as well as in the city, I have never encountered a single instance of lead disease in any of its forms. I remember making inquiries about the effects of lead from an intelligent house-painter, who was my patient in the hospital for some other disease; and it appeared that he had never even heard of workmen in his trade being liable to any disease depending on exposure to lead. It is so far in accordance with your conclusions, that we know as little of gout, as of lead disease, among our hospital patients. Gout occurs very rarely. I have known but two cases of it among my whole hospital service; both were in fat, evidently over-fed butlers. I was anxious to ascertain the cause of exemption of our painters and plumbers from lead disease, especially painters, who suffer from it so much elsewhere—even in London, for example. A journeyman, who had been

a house-painter for seventeen years, a part of which he had spent in London, was well acquainted with lead-colic and lead-palsy, as occurring amongst his fellow-workmen in the capital. He assured me that neither he nor any painter of his acquaintance in Scotland had ever known either disease among painters who had worked only in Edinburgh. He ascribed the difference between London and Edinburgh to the circumstance, that in Edinburgh they are never so far from their homes as to be prevented from going thither for their meals; that they therefore take off their working-dress, or overalls, and wash their hands and faces before going to meals; but that in London, workmen are so far from home or their master's establishment, that they cannot go home for breakfast or dinner; that they therefore take their meals where they work, and do not then take the trouble of changing their dress before they feed. This appeared to be a very feasible explanation of the difference, and various master painters and journeymen have since confirmed that man's account."

One circumstance, which appears to point to the conclusion that lead alone does not very powerfully predispose to gout, is the fact that women engaged in white-lead manufactories, and who often suffer from colic, are not afflicted with gout in like ratio with men, but the influence of sex may possibly account for this immunity.

To ascertain the manner in which lead acts, I have been led to make several observations and experi-

ments, which appear to throw light upon the subject; these have consisted, first, in ascertaining, in several instances, the condition of the blood and urine of patients under the influence of this metal, and secondly in determining the effect which lead has upon the secretion of uric acid, when administered medicinally.

The results of the investigation in twelve cases in which the blood was examined are exhibited in the annexed Table :—

Case 1. J. S., Organ Pipe Maker. Æt. 44.	Wrist drop. Has had lead colic.	Within the last four years has experienced several slight attacks of gout.	Blood rich in uric acid. Average daily excretion of uric acid by kidneys = 4·97 grains.
Case 2. R. T., Painter. Æt. 34.	Lead colic.	Slight threatening of gout in great toe, but no attack.	Blood contained uric acid. Moderate amount of uric acid in urine.
Case 3. I. J., Labourer at Lead Mills. Æt. 42.	Lead colic.	Never had gout.	A moderate quantity of uric acid in blood.
Case 4. T. C., Painter. Æt. 46.	Wrist drop. Has had lead colic.	Never had gout.	An abnormal amount of uric acid in blood.
Case 5. J. B., Artist. Æt. 41.	Wrist drop and lead colic.	No gout until after admission into the Hospital.	Uric acid abundant in blood, and very deficient in urine.
Case 6. C. D., Painter. Æt. 24.	Lead colic.	Never had gout.	No uric acid in blood taken during convalescence.

Case 7. J. C., White Lead Labourer. Æt. 36.	Lead colic.	Never had gout.	No uric acid found in blood.
Case 8. J. C., Painter. Æt. 46.	Colic and wrist drop.	Never had gout.	Uric acid in blood.
Case 9. H. M., Painter. Æt. 31.	Colic and wrist drop.	Never had gout.	Much uric acid in blood.
Case 10. W. P., Japanner. Æt. 55.	Wrist drop.	Never had gout.	Blood rich in uric acid.
Case 11. J. B., Gasfitter. Æt. 29.	Wrist drop.	Never had gout.	Uric acid in blood.
Case 12. W. B., Hotel Porter. Æt. 34.	Wrist drop.	Never had gout.	Much uric acid in blood.

From the above Table it will be observed, that uric acid is almost invariably present in the blood in cases of lead poisoning, not only in those who have previously suffered from gout, but even where no symptoms of that disease had ever shown themselves; this fact is of much importance, inasmuch as, with this exception, the presence of uric acid in abnormal quantities, save in cases of gout, is excessively rare.

I have had two opportunities of examining the effects of lead, when administered as a medicine,

upon the secretion of uric acid by the kidneys, and the results, although requiring much further confirmation, are not without interest. The investigation of the subject is beset with difficulties, as the cases in which the salts of lead are employed are not numerous, and it is only now and then that the urine is capable of being accurately collected from such patients. The first analyses were made on—

A man about thirty years of age, who had been passing for several days the following amounts of uric acid: 6·03 grains, 5·23 grains, 5·59 grains, 6·69 grains, and 8·98 grains, the average for the five days being 6·50 grains. Acetate of lead, in four grain doses, made up into a pill, was then taken three times a day, and the amounts of uric acid passed the five following days were: 5·33 grains, 1·84 grains, 4·58 grains, 2·87 grains; the average being 3·65 grains (the result of the third day was lost by accident). The lead was only continued three days, as some nausea and sickness were induced. About a week after, a draught containing three grains of the lead salt dissolved in water, with a few drops of dilute acetic acid, was given three times a day. During the next seven days the amounts of uric acid were: 2·67 grains, 0·24 grain, 5·08 grains, 0·23 grain, 2·95 grains, 5·55 grains, and 1·93 grains, averaging 2·66 grains. During the next period of seven days the lead being omitted and some slight tonic administered, the quantity of uric acid eliminated each 24 hours was: 7·45 grains, 6·21 grains, 6·18 grains, 5·23 grains, 6·17

grains, 8·58 grains, 12·69 grains, the average being 7·50 grains.

The next patient to whom the drug was administered was a young man about 19 years of age, who, for the nine previous days, passed the following amounts of uric acid: 7·68 grains, 7·70 grains, 6·53 grains, 6·50 grains, 8·64 grains, 5·24 grains, 5·85 grains, 6·84 grains, and 6·20 grains, averaging 6·76 grains. During the next ten days, when taking two grains of acetate of lead three times a day, the amounts of uric acid excreted were as follows: 4·74 grains, 1·92 grains, 5·62 grains, 7·56 grains, 3·34 grains, 7·80 grains, 6·07 grains, 9·27 grains, 6·40 grains, and 6·51 grains, averaging 5·92 grains.

It will be seen from these observations that in both patients a well-marked diminution of the excreted uric acid occurred under the influence of lead. In the first case it was most marked, being more than one-half. In the second the decrease was also evident, though not so considerable. In both cases, however, a very peculiar phenomenon was observed, namely, that after the drug had been given for a day or so, a sudden arrest of the excretion of uric acid ensued, and the function of the kidneys became more or less intermittent, as previously ascertained to be the case in patients labouring under gout.

It would appear, therefore, that in individuals impregnated with lead the blood becomes loaded with uric acid, not from the increased formation of this principle in the system, but from its imperfect excre-

tion by the renal organs. Strong evidence has also been adduced, showing that patients the subjects of lead poisoning are, *cæteris paribus*, more liable to become affected with gout than others.

I have as yet seen no proof that other metals possess a similar power in diminishing the excretion of uric acid; that some may, is not improbable; there are, indeed, certain statements, which appear to show that lime exerts some influence upon the development of gout. It was remarked by Musgrave, that in Devonshire gout became frequent among the inhabitants when chalk was freely employed in agriculture, and physicians have made the same observation with regard to the island of Crete, and other countries, but at the same time it is not difficult to adduce strong evidence antagonistic to this view. It is true there are certain chemical characters common to lime and lead, and even some physiological and therapeutic resemblances may be traced.

Exciting Causes of Gout.—Several of the causes of gout which we have considered will, if at any time suddenly increased in intensity, act in immediately exciting a fit of the disease; but there are others which, although potent as exciting, are altogether powerless as predisposing causes. The amount of exciting cause necessary to produce an attack depends greatly on the proneness of the patient's system to take on gouty action, for we often see trivial irregularities which produce no inconvenience in one indi-

vidual, readily excite attacks of gout in another; and it will also be found that causes which excite an attack, unlike those which induce the disease, are to a great extent dependent upon constitutional peculiarity; thus, in one case exposure to cold, in another a fit of indigestion, in a third some shock to the system, will act as the exciting agent.

Alcoholic Beverages.—One most common exciting cause of an attack of gout is drinking at any one time an unusually large amount of alcoholic fluids, or the partaking, even in moderation, of certain wines, as champagne, or malt liquors which have become hard from acidity. So potent, indeed, is the influence of special wines, that some patients cannot take a single glass of champagne without the occurrence of a fit of gout as an almost immediate consequence; in others, port wine acts more powerfully; in others, Madeira cannot be tolerated; the cause of such differences appear to depend on peculiarities of the digestive and assimilating functions. I have met with many instances illustrating the effects of the above-named wines, and likewise of strong ale. I lately saw a gentleman with his first attack of gout, evidently excited by taking an unusual amount of exercise, and drinking freely of beer. Cider and perry will occasionally act in a similar manner.

Several instances showing the power of some of these alcoholic fluids in exciting gout have been related. One gentleman, disposed to gout, but never

having experienced an attack in the summer season, induced a fit by taking six or seven glasses of champagne. Another was sensible of gouty pains in his limbs before quitting the dinner-table, from partaking of the same wine. A third brought on a most severe fit by indulging for a short time in French wines. A fourth found his great toe hot, throbbing, stiff, and painful, when he drank port wine, even sparingly, for a week. And lastly, in a patient, subject to gout in a very slight degree, pricking pains in the toe immediately occurred after taking two glasses of port wine.

These instances might be multiplied almost indefinitely, for every physician who has had the opportunity of seeing much of this disease could relate examples fully confirming what has been stated. The knowledge of the power of alcoholic stimulants in immediately exciting a gouty paroxysm, can occasionally be usefully employed in diagnosis; and I believe it may be safely asserted, that *when a few glasses of wine, ale, or porter, quickly and invariably produce in any individual an inflammatory affection of a joint, such inflammation is of a truly gouty character.*

Dyspepsia is another powerful exciting cause of a gouty paroxysm, and not unfrequently we meet with patients who attribute their attacks to the use of certain articles of diet which have induced disturbance of the digestive organs, and more especially to such as lead to the production of acidity. Overloading the stomach with a variety of highly-seasoned and

indigestible dishes, taking different varieties of alcoholic beverages at one meal (more injurious than the same amount of any one kind), may be soon followed by a gouty paroxysm. Temporary congestion of the liver, leading to an alteration in the secretion and flow of bile, may also be attended with like consequences.

I have seen a severe attack of gout, the result of indigestion, caused by taking a hot bath soon after a full meal; and as showing the influence of acids and indigestible articles of food in exciting gouty symptoms, Dr. Petit relates the case of a Dr. Guersent, whose joints, usually a little tender, became so troublesome after partaking of citron, as to prevent his walking. Another patient informed Dr. Petit, that he was certain to bring on an attack of gout by eating "*des pommes au beurre,*" especially when the fruit was unripe and acid: and the same author relates an instance of a gouty priest, who induced an attack of the disease twice in one year, the day after partaking of the dish called "*du veau à l'oseille;*" and, lastly, Larry asserted that he had seen a man who, whenever he drank lemonade, felt sharp pains in the joints of his lower extremities.

Cold and moisture, although I believe absolutely incapable of inducing a gouty diathesis, or of leading to the production of gout, will in many subjects act powerfully as exciting causes. I have attended several patients in whom this fact was well exemplified, cases in which there could be no possible doubt as to the

real nature of the malady. In one instance, a gentleman in whom the disease commenced in the ball of the great toe, and always presented the characteristic phenomena of true gout, whose blood was likewise proved to be loaded with uric acid, the attacks were always excited by easterly winds, and in no way connected with any appreciable disturbance of the stomach or bowels. The local application of cold, even getting the feet wet, will often prove sufficient to excite a fit in gouty persons; and among the lower classes this cause is frequently operative, though not accompanied with indulgence in alcoholic liquors.

When cold acts as an exciting cause of gout, the effect is due in part to its arresting the secretion of the skin, and checking the escape of acid; at the same time it must be remembered that a chill to the surface is necessarily accompanied by congestion of the internal organs, leading to functional derangement; cold may also occasionally act by its direct depressing influence upon the nervous system.

Extreme mental or bodily labour, or depression from any other cause, is prone in some patients to induce a fit of gout. Sitting up late at night, especially when combined with severe study, will often occasion an attack. Van Swieten relates the case of an eminent mathematician, who brought on a fit by the long and constant application of his mind to the solution of a difficult problem; and Sydenham, as before noticed, always induced gout when devoting more than usual attention to the composition of his Tract. Violent

excitement, as an outburst of passion, will act in a similar manner. Great bodily fatigue, as a long walk, is sometimes followed by a fit, and the same may result from a severe blow, fall, or other injury; many examples are on record in which fractures of limbs, dislocations of joints, surgical operations, have been followed by an attack of the disease. Local injury not only acts in exciting gout, but frequently determines the situation or locality of the inflammation; thus, an injury to the knee or ankle will usually cause these joints to be primarily affected, although the great toe or some other part may subsequently become implicated.

Hemorrhage may act as the exciting cause, and the effect is then probably due to depression. I have seen, for example, a first fit of gout produced by copious hematemesis; by loss of blood following the extraction of a tooth, by epistaxis and other forms of hemorrhage. On the other hand, it is not uncommon to find the suppression of an ordinary discharge of blood, as the sudden stoppage of the catamenia, immediately followed by a paroxysm. M. Duringe relates the case of a lady in whom the cessation of the catamenia, caused by a violent fright, was followed by several attacks of gout, which ceased when the patient again became regular. Cases illustrative of the effects of the suppression of an habitual hemorrhoidal discharge are by no means uncommon.

The depression of the system caused by any other exhaustive disease will occasionally excite a fit of gout,

and several instances arising from boils and carbuncles have come under my notice.

In concluding this branch of our subject I may remark, it would appear that all causes leading either to an increased formation of acidity in the system, or its defective elimination by the skin, and all causes suddenly depressing nervous energy, have a powerful influence in exciting an attack of gout in subjects already predisposed to it.

CHAPTER IX.

PATHOLOGY OR NATURE OF GOUT:—EVIDENCE OF A CLOSE RELATION BETWEEN GOUT AND URIC ACID—CHARACTERS AND COMPOSITION OF URIC ACID AND ITS SALTS—PRODUCTS OF ITS METAMORPHOSIS UNDER DIFFERENT CIRCUMSTANCES—ITS OCCURRENCE IN DIFFERENT CLASSES OF ANIMALS—ITS PHYSIOLOGICAL AND PATHOLOGICAL RELATIONS—OPINIONS OF THE ANCIENTS ON THE NATURE OF GOUT—CULLEN'S OBJECTIONS TO THE DOCTRINE OF THE HUMORAL PATHOLOGISTS, AND HIS OWN VIEWS ON THE SUBJECT—MURRAY FORBES' THEORY—OPINIONS OF SIR C. SCUDAMORE, SIR. H. HOLLAND, DR. BARLOW, DR. GAIRDNER, AND OTHERS—AUTHOR'S OWN VIEWS ON THE NATURE OF GOUT—EXPLANATION OF THE GOUTY DIATHESIS AND PREMONITORY SYMPTOMS—EXPLANATION OF THE PAROXYSM AND VARIOUS PHENOMENA CONNECTED WITH THE DISEASE.

HAVING passed in review the phenomena ordinarily presented by gouty subjects, at least by those labouring under the more typical forms of the disease; having also ascertained the peculiar alteration of the blood and urine, and the morbid changes exhibited by the different tissues affected by gouty inflammation; and lastly, having studied the causes which act most powerfully both in predisposing and exciting the malady, we must now enter upon a very difficult investigation, the determination of the true nature or essence of gout.

From a perusal of the contents of the preceding chapters, more especially such as relate to the altered

composition of the blood, and the chemical characters of the external deposits occurring in gouty patients, and of the matter infiltrated in the tissues in and around the joints, the reader cannot fail to have remarked, whatever may have been his previous views of the pathology of the affection, that a very intimate relation exists between uric acid and the disease in question; such being the case, it will be advantageous to give a slight sketch of the nature and composition of this acid, and its relation to the organism in the different classes of animals, and under the varying circumstances of health and disease.

Uric acid, or lithic acid,* as it is sometimes called, occurs, when perfectly pure, in small white glistening plates, consisting of flattened rhombic crystals, so fine as to give it the appearance, to the naked eye, of an amorphous powder; but when examined by the microscope, its crystalline structure is at once recognised, and the forms it assumes are depicted in Plate 5, fig. 5, and Plate 6, fig. 1. When separated from the urine of serpents and birds, it is quite white; but when procured from human urine, it has usually a yellowish or red tint, depending on the great affinity possessed by this acid for colouring matters, and its power of carrying them down when precipitated from any coloured fluid. The solubility of uric acid

* Uric acid was first discovered in urinary calculi and urine by Scheele in 1776; it was called lithic acid by Morveau, but afterwards named uric acid by Fourcroy, by which designation it is commonly known at the present day.

in water is extremely limited; it requires, according to Dr. Prout, as much as 10,000 times its weight of cold water, and even 15,000 times, according to other observers; in boiling water it is more soluble, dissolving in about 1800 parts. Although possessing the chemical properties of an acid, its watery solution does not give the reaction to litmus paper. Uric acid is insoluble in alcohol or ether, somewhat more soluble in dilute hydrochloric acid than in water, and pretty freely soluble in strong sulphuric acid, from which it is again separated on dilution with water. In many saline solutions uric acid dissolves readily, as, for example, in fluids containing alkalies and their carbonates, for urates of these bases are then formed,—salts more soluble than the acid itself. Uric acid is also rendered more soluble by means of the phosphate or bi-borate of soda; to the former salt, which is naturally strongly alkaline, it is found to impart an acid reaction, a result arising from the formation of the urate of soda, and the simultaneous production of the acid bi-phosphate of soda.

The composition of uric acid may be represented by the formula—

$$HO,\ C_5\ HN_2,\ O_2,\ \text{or as a bibasic acid by}\ C_{10}\ H_4\ N_4\ O_6,\ \text{or}$$
$$2\ HO,\ C_{10}\ H_2\ N_4\ O_4,$$

the water in the latter formula being considered as basic, and capable of being replaced in whole or in part by a fixed base, forming two classes of salts, one termed neutral, the other acid or bi-salts.

The salts of uric acid which possess most interest to the physiologist and pathologist are represented in the accompanying Table, to which their composition and solubility are likewise appended.

Bi-urate of soda . . . . HO, NaO, C_{10} H_2 N_4 O_4+HO. Soluble in about 124 parts of boiling water and 1150 parts of cold water, 60° Fahr. This salt exists in urine and gouty blood, is also deposited within the tissues of gouty subjects. Crystallises in six-sided prismatic needles, frequently radiating from a centre.

Bi-urate of ammonia . . . . HO, NH_4 O, C_{10} H_2 N_4 O_4. Sometimes exists in human urine and urinary calculi, and birds' and serpents' urine. Crystallises in needles and rounded masses, with projecting spiculæ, soluble in about 1600 parts of water at 60° Fahr., more soluble in hot water.

Bi-urate of potash . . . . HO, KO, C_{10} H_2 N_4 O_4. Soluble in 700 parts of cold water, about 65° Fahr., and in 79 parts of boiling water.

Bi-urate of lime . . . . HO, Ca O, C_{10} H_2 N_4 O_4+2 HO. Dissolves in 603 parts of cold water.

Bi-urate of magnesia . . . . HO, MgO, C_{10} H_2 N_4 O_4+6 HO. Dissolves in about 160 parts of boiling water, and in 3750 parts of cold water. Crystallises in needles.

Bi-urate of lithia . . . . HO, Li O, C_{10} H_2 N_4 O_4. Its solubility is much greater than any other known urate, but has not as yet been accurately determined. It crystallises in long prismatic needles.

The neutral urates of these bases, with the exception of those of ammonia and magnesia, can be artificially obtained, but, as they are decomposed and converted into bi-urates by the action of carbonic acid, which abstracts half the combined base, they cannot exist in the fluids of the animal body, and possess comparatively little physiological or pathological interest.

Uric acid, when acted upon by oxidising agents, is disintegrated, and the nature of some of its decompositions is of considerable interest; thus, when boiled in water with the puce-coloured oxide of lead, the products are urea, oxalic acid, and allantoin, the latter a principle contained in the allantoic fluid of the cow. Such a metamorphosis often occurs in the animal economy; Wöhler, for example, found that when a solution of uric acid was injected into the veins of a dog, oxalic acid appeared in the urine; in urinary calculi from the human subject alternate layers of urate of soda and oxalate of lime are often seen, and in the urine of patients usually giving rise to a deposit of urates, slight circumstances, as change of weather and differences of diet, will cause these salts to be suddenly replaced by a crystalline deposit of oxalate of lime.

When uric acid is submitted to the action of nitric acid, alloxan and alloxantine are formed, and with the addition of ammonia, the beautiful colouring matter murexide can be obtained, the production of which forms so valuable a test of the presence of the acid. When uric acid is subjected to the action of a high temperature, as during dry distillation, the products of its decomposition are urea, prussic acid, and carbonate of ammonia; and when decomposed by fusion with a caustic alkali, cyanogen compounds are likewise produced.

The physiological and pathological relations of uric acid, as far as they are at present known, may be thus shortly enumerated. It is a constituent of the

urine of the healthy human subject, and the daily amount excreted by the kidneys may be estimated at about eight grains. It is also contained in the merest traces in healthy blood. It has likewise been shown by Scherer to be contained in the spleen. In the urine of many other animals it is a normal constituent, sometimes existing in small amounts, sometimes forming the chief ingredient of the excretion. It appears to exist in minute proportions in the urine of the graminivorous mammalia, as the ox and cow, as asserted by Fownes, Bödeker, and Brücke, and the calf, according to Wöhler; in the carnivorous mammalia it is usually present in much greater quantities than in graminivorous, though less than in man; the correct estimate of uric acid in these animals is attended with much difficulty, and when opportunities of making the examinations occur, the urine can scarcely be considered to be in a natural state, owing to the influence of confinement. Uric acid has been discovered by different observers, especially by Hieronymi and Vauquelin, to be a constituent of the urine of the lion, tiger, leopard, panther, bear, hyena, wolf, and dog; but in the pig's urine it has not yet been found.

In the urinary secretions of birds, it is a very large and constant constituent, forming the principal ingredient of the semi-solid white substance which is seen to invest their excrements. When chemically examined, this white matter is found to consist of urate of ammonia, or more strictly speaking the acid or bi-urate, and under the microscope is observed to be composed

of minute spherical or oval masses, having the appearance represented in Plate VI., fig. 2 (b), a drawing taken from the urine of the pigeon: the same appearance is exhibited by the urine of all birds, and the size of the masses appears from my observations to be very similar, whether derived from the largest species of birds, as the ostrich, or the smaller kinds, as the canary. These oval masses are crystalline, depolarise light, exhibit lines radiating from a centre, with frequent wedge-shaped indentations. The renal secretion of reptiles and many of the invertebrata exhibits similar characters. I may remark that in birds the semi-solid urine seems to contain little else than the urate of ammonia combined with water; no trace of urea is ordinarily present, but it is asserted by Coindet to be a constituent of the excretion of carnivorous birds. Guano, which is the excrement, or rather the urine of sea birds, is usually rich in uric acid.

In the urine of reptiles, uric acid is an abundant ingredient; the urine of the boa constrictor and python forming the chief source of the uric acid of commerce. In the ophidians, as in the case of birds, almost the whole mass of the urine consists of urate of ammonia, no urea being present.

The urine of most saurians is rich in urate of ammonia; it has been found in the crocodile, lizard, and iguana. In the chelonian reptiles, as the tortoise and the turtle, it is likewise present.

The different statements which have been made in

reference to the urine of the tortoise are easily explained. One observer, for example, has asserted it to be rich in urate of ammonia; another, free from this salt; the discrepancy evidently depends on the state of the animal in relation to food: when a tortoise has not taken nourishment for months, as in the early spring, the urine is usually clear and rich in urea, but when nourishment is freely taken, the urine becomes creamy in consistence, and contains, in addition to urea and hippuric acid, a large amount of urate of ammonia.

In fish the composition of the urine has been little studied, but some observers have noticed the presence of uric acid; probably it resembles that of the chelonian reptiles.

In the invertebrata the presence of uric acid is nearly constant; it has been discovered in the silk-worm, butterfly, and house-fly, also in the moth, caterpillar, grasshopper, cricket, common and Spanish beetle, and many species of Meloë; indeed it is probable that the nitrogenised excretion of invertebrate animals is chiefly in the form of urate of ammonia.

From the above remarks it will be observed that the occurrence of this acid is very constant throughout the animal series, although the proportion in which it is thrown out is liable to extreme variation, as it sometimes forms the sole nitrogenised excretion, at other times a mere indication of its presence is all that can be discovered.

The amount of uric acid excreted by the human subject is subject to much alteration, arising not only

from the presence of disease, but from circumstances in no way incompatible with the existence of perfect health. It is essential, however, that we should bear in mind that the indication afforded by the secretion of this acid cannot always safely be taken as an index of the quantity formed in the system, for the kidneys may lose their power of eliminating it by the urine, even when it exists in abnormal proportions in the blood; a fact proved beyond doubt in the preceding pages, and of much importance in the pathology of gout.

Among the circumstances especially influencing the amount of uric acid, at least in the oviparous animals, may be mentioned the character and amount of the food, the time of its exhibition, and the perfection of its assimilation by the digestive organs. That the formation of uric acid is much altered by the nature of food is made evident by the result of some experiments made by Boussingault, in which he ascertained that ducks fed with different substances excreted varying amounts of this acid in the twenty-four hours. For example—

When no food was administered, the quantity thrown out was	4·163 grains.
When balls of clay were exhibited the amount was also	4·163 ,,
Under a diet consisting of gum	4·412 ,,
When casein was given	162·4 ,,
Under a gelatine diet	157·08 ,,
Ditto, in another trial	203·28 ,,
Under a diet consisting of fibrine	138·6 ,,
Ditto, of flesh	291·0 ,,

Although Boussingault's results show that the uric acid is derived mainly from the administration of food, less than five grains being excreted by these animals when fasting or when substances containing either no nutriment or non-nitrogenised ingredients were given, still we have abundant proof that animals living on a vegetable diet will eliminate a considerable amount of uric acid. A tortoise feeding on lettuces throws out semi-fluid urate of ammonia in considerable amounts, doubtless derived from the nitrogenised principles contained in the plants which these animals devour in great quantity.

Lehmann's trials on his own person lead to a similar result, but at the same time indicate that in the human subject the nature of the food influences the secretion of uric acid, much less than that of the urea. This observer found that he passed in the twenty-four hours*:—

On a strictly vegetable diet	.	15·5	grains of uric acid.
On a mixed diet	.	17	,, ,,
On a strictly animal diet	.	21·5	,, ,,

It seems probable that if the diet is only sufficient to keep up the proper nutrition of the body, the amount of uric acid would be, *cæteris paribus*, the same, whatever the nature of the diet, assuming however that the food is of a wholesome character, the stomach

* It will be observed that Lehmann secreted an amount of uric acid far above the average we have adopted; this he accounts for by stating that he was labouring under some softening of the pulmonary tissue.

in a condition to digest it completely, and the individual in the enjoyment of perfect health.

Any circumstance leading to imperfect digestion and assimilation, whether it depends on the nature of the food, or the condition of the assimilating organs, may at once alter, not only the absolute formation of uric acid, but likewise its relation to the other solid ingredients. Lehmann, for example, found the ratio of uric acid to the urea in a normal condition was one to twenty-eight or thirty, and to the rest of the solid matter of the urine as one to sixty; but in indigestion, the uric acid was to the urea as one to from twenty-three or twenty-six, and to the rest of the solids as one to from forty-one or fifty-two.

The relation of the uric acid to food is also well shown by the experiments of Dr. H. Bence Jones; but these indicate rather the immediate effect of diet than its absolute influence, and show that during the time the food is undergoing the process of digestion the amount of uric acid eliminated by the healthy subject is at its maximum.

Before taking food, the urine was of sp. gravity 1024, and 1000 grains yielded 0·049 grains of uric acid.

After animal food, the urine was of sp. gravity 1027, and 1000 grains yielded 1·022 grains of uric acid.

After vegetable food, urine sp. gr. 1025, and 1000 grains yielded 1·010 grains of uric acid.

It is a matter of extreme difficulty to discover the many causes which affect the formation and secretion of uric acid, and before we can hope to throw much

further light upon the subject many new and extended investigations are required.

It was assumed by Liebig that the function of respiration possessed much influence, and in proof of this hypothesis the fact was brought forward that the carnivorous mammalia excreted very little uric acid, whereas ophidian reptiles living on similar food, threw out enormous quantities of the same acid. In the former class of animals the respiratory function is active, and consequently the amount of oxygen consumed is very great, whereas in the latter it is at an exceedingly low ebb.

The chemical explanation of this supposed action of oxygen was very simple, and accorded well with the known influence of oxidising agents in breaking up uric acid into less complex organic compounds, and especially urea.

Unfortunately for this theory, at first sight very attractive, many facts can be adduced which at once show its fallacy; for we have only to consider the character of the urinary secretion in birds and insects to be convinced of its utter inefficiency to explain the phenomenon. The urine of birds and insects chiefly consists of urate of ammonia, yet their respiratory function is extremely active, and the amount of oxygen which they consume, compared with the weight of their bodies, is perhaps greater than in any other class of animals. It may be that, *cæteris paribus*, the amount of oxygen consumed has some relation to the excreted uric acid, but certainly under varying circum-

stances, and in different animals, the nature of this relation cannot be demonstrated.

In the investigation of the amounts of uric acid secreted in different diseases, too many other disturbing causes beside the mere alteration of the respiratory function must be taken into account, to allow us at present to lay much stress upon the results; as a rule, in febrile and inflammatory affections there is an augmentation of this principle, and more especially when the liver and spleen, or any organ connected with the portal circulation, are implicated.

The condition of the cutaneous function has generally been supposed to affect the secretion of uric acid, an opinion supported by the appearance of deposits of urates in the urine when a patient is under the influence of a cold, as likewise by the frequent occurrence of urinary calculi, composed either of this acid or its derivatives, in the eastern counties of England, where the influence of the bleak north-east winds is keenly felt. Probably the function of the skin may possess some power in altering the formation of uric acid, but its chief influence is undoubtedly exerted in altering its solubility in the urine. Suppressed perspiration is immediately followed by an increase of urinary acidity, and hence by the precipitation of the uric acid either in the form of urate of soda or in a free and crystalline state.

Exercise probably influences the formation and excretion of uric acid, but its exact effect has not yet been clearly defined. Lehmann found that when under active exertion, the ratio between the uric acid

and urea in his own urine became much lessened; when at rest, and under a fixed diet, it was as one to thirty-eight, but after considerable exercise the ratio was as low as one to seventy-seven. Other observers, however, have found an increase of uric acid produced by exercise; the evidence on this head is therefore discrepant.

Having given a résumé of the more important facts which have been ascertained concerning the formation and excretion of uric acid in the different classes of animals and under varying circumstances in the human subject, we are now in a position to consider more particularly the numerous views which have been held from time to time of the nature of gout. We have already had occasion to observe that the ancient physicians were well acquainted with most of its phenomena, and they likewise speculated to some extent on the intimate nature of the disease, but being ignorant of the peculiar changes in composition and structure which ensue in the fluids and tissues, they had no opportunity of arriving at its true pathology.

The ancients were chiefly humoralists, and considered gout to be produced by some morbid condition of the blood, but the nature of the alteration was regarded differently by various writers, some considering it due to the presence of phlegm, others to bile, and a third to a mixture of these fluids; chalk stones were looked upon by all as due to the exudation and concretion of those impurities. The ideas on this subject entertained by several of the principal ancient

authors, as Galen, Aretæus, Cælius Aurelianus, Alexander, Aëtius, Paulus Ægineta, and Demetrius Paleologus, are sufficiently detailed in our introductory chapter, as likewise the opinions held by the Arabians and other physicians up to the latter half of the present century, including Avicenna, Rhases, Serapion, Hoffman, Coste, &c.

In the latter half of the last century, Cullen became the great opponent of the ancient humoral doctrine of gout, and, in his work on the "Practice of Medicine," brought forward many arguments which (at the time they were propounded) were of themselves powerful, and made still more so from the weight of his authority: the substance of these arguments, which embody the chief objections made by subsequent anti-humoralists, may be thus summed up:—In the first place, he urges that there is no evidence of any morbid matter being present in persons disposed to gout, and that there are no experiments or observations which show that the blood or secretions of gouty subjects are in any way different from those of other persons; that previous to attacks of gout there are no signs of any morbid state of the fluids, and the disease generally attacks those who usually enjoy the most perfect health, and who even appear to be so when the disease comes on. Cullen allows, however, that at certain periods of the disorder, a peculiar matter appears in gouty patients, but that this occurs only in a few instances, and only after the disease has subsisted a long time, and he looks upon such an

occurrence as the effect and not the cause of the malady. Furthermore, although he says that there are certain acrid substances which when taken seem to excite gout, yet he considers that they do not operate by affording the material cause of it, but in some inexplicable manner.

From these considerations, Cullen concludes that there is no proof of any morbid matter being the cause of gout.

In the second place, he looks upon the suppositions concerning the particular nature of the morbid matter as too vague and contradictory, and many of them too inconsistent with chemical philosophy and the laws of the animal economy, to allow us to conclude that any such principle exists.

Thirdly, he considers that the idea of a morbid matter being the cause of gout is not consistent with the phenomena of the disease, particularly with its frequent and sudden translation from one part to another.

Fourthly, he argues that if any morbid matter does exist, its operation should be similar in the several parts which it attacks; whereas it seems to be different, exciting inflammation in the joints, but acting as a sedative and destroying tone in the stomach.

Fifthly, he looks upon the disease being non-contagious, as favouring the idea of its being unconnected with the presence of a peccant matter in the system. In explanation of this remark, it must be remembered that, prior to Cullen's time, there

were many who thought gout contagious, and instances supposed to favour such views are to be found in many old authors, as Boerhaave, Van Swieten, and others.

Sixthly, he thinks that the fact of the disease being hereditary is no proof of its humoral origin, for he argues that most hereditary diseases do not depend upon the presence of any morbid matter, but upon a particular conformation of the body, transmitted from the parent to the offspring; and this he says applies particularly to gout. He also asserts that hereditary diseases depending on a morbid poison, always appear earlier in life than is usual with gout.

Seventhly, he states that the humoral view of the disease has hitherto not suggested any successful method of cure, but has sometimes led to injurious treatment.

Eighthly, he regards the idea of the presence of a morbid matter as altogether useless; that it explains nothing, without supposing that it produces a change in what he terms the moving powers; while a change in the state of these powers explains every circumstance without the supposition of morbific matter.

Lastly, Cullen considers the view superfluous, thinking that without such supposition the disease can be explained in a manner more consistent with its phenomena, with the laws of the animal economy, and with the method of cure which experience has dictated. After having urged these numerous objections against the humoral pathologists, most of which

can be shown to be devoid of weight at the present time, and many absolutely erroneous, Cullen proceeds to enunciate his own view of the nature of gout, a view which, in a somewhat modified form, has found numerous supporters up to the present time. Arguing from the statements, that males are especially affected with gout, and that those of the opposite sex who suffer from it are usually robust and of full habit, that eunuchs are seldom afflicted with it, and that the disease attacks robust men with large heads, Cullen arrives at the conclusion that gout depends on a peculiar conformation, and more especially on an affection of the nervous centres, in which he thinks the primary moving powers of the whole system are lodged. He looks upon the exciting causes of the disease as intemperance, indigestion, depressing influences, and cold, as acting directly upon the nervous system, and considers most of the symptoms of retrocedent gout, to be afterwards described, as manifestly affections of the same kind. He also considers the stomach, an organ so universally sympathising with the rest of the body, as most frequently and most considerably implicated in gout; an opinion he deduces from the fact that symptoms of dyspepsia generally precede an attack, and many of the exciting causes of a paroxysm act first upon the stomach, and that in retrocedent forms of the disease this organ is commonly affected. He also thinks a balance exists between the state of the internal and external parts, and that the condition of the stomach is intimately connected with

the latter, so that the state of tone in the one may be communicated to the other.

From these premises, Cullen forms his view of the pathology of gout, which is thus expressed in his own words:—

"In some persons there is a certain vigorous and plethoric state of the system which, at a certain period of life, is liable to a loss of tone in the extremities. This is in some measure communicated to the whole system, but appears more especially in the functions of the stomach. When this loss of tone occurs, while the energy of the brain still retains its vigour, the *vis medicatrix naturæ* is excited to restore the tone of the parts: and accomplishes it by exciting an inflammatory affection in some parts of the extremities. When this has subsisted for some days, the tone of the extremities and of the whole system is restored, and the patient returns to his ordinary state of health.

"This is the course of things in the ordinary form of the disease, which we name the *regular gout;* but there are circumstances of the body in which this course is interrupted or varied. Thus, when the atony has taken place, if the reaction do not succeed, the atony continues in the stomach, or perhaps in other internal parts, and produces that state which we have, for reasons now obvious, named *atonic gout.*

"A second case of variation in the course of the gout is, when, to the atony, the reaction and inflammation

have to a certain degree succeeded, but, from causes either internal or external, the tone of the extremities, and perhaps of the whole system, is weakened; so that the inflammatory state, before it had either proceeded to the degree, or continued for the time, requisite for restoring the tone of the system, suddenly and entirely ceases. Hence the stomach, and other internal parts relapse into the state of atony; and perhaps have this increased by the atony communicated from the extremities: all which appears in what we have termed *retrocedent* gout.

"A third case of variation from the ordinary course of gout is when, to the atony usually preceding, an inflammatory re-action fully succeeds, but its usual determination to the joints by some circumstances prevented; and is, therefore, directed to an internal part, where it produces an inflammatory affection, and that state of things which we have named the *misplaced* gout."

Most of the dogmas enunciated by Cullen are capable of being entirely disproved at the present day, for it can be shown that a morbid matter is *constantly* present in all cases of true gout, not only during the inflammatory stage, but even before the occurrence of the attack, and consequently the first statement of Cullen is completely erroneous. Again, the very nature of the morbid matter can now be accurately defined, and its composition clearly demonstrated. The objection that the phenomena of the disease are not consistent with the supposition of their being caused

by the presence of a morbid matter, has likewise little weight, for we know that certain poisons select particular parts of the economy upon which to exert their force. Atropine, for example, peculiarly affects the pupil of the eye, as well as the mouth, throat, and skin; strychnia acts upon the spinal cord: the poisons of various eruptive fevers also make particular selections,—that of scarlatina implicating the throat, skin, and kidneys, and that of rubeola the skin and mucous membranes. The argument that in one part, as a joint, gout acts as a stimulant; in another, as the stomach, as a sedative; can have little or no weight with any one conversant with pathology, for inflammatory action is usually accompanied with diminution or destruction of the proper functions of the organ affected.

The fact of gout not being contagious would at present be considered no proof that the phenomena it displays are incapable of being produced by some morbid element in the blood, and therefore the fifth objection of Cullen falls to the ground; and the sixth, founded on the assumption that most hereditary diseases depend on a particular conformation of the body, cannot have much weight, for we know that many hereditary affections are most indubitably produced by the presence of a specific poison in the economy.

The three remaining objections need scarcely occupy our attention; the fact of a humoral view of the pathology of gout not having led to an improvement

in its treatment, might with equal justice be urged against the views of the solidist; and most pathologists of the present day must feel the want of some more satisfactory explanation of the phenomena of the disease than that afforded by Cullen or any of his followers.

In 1793, a small work was published by Mr. Murray Forbes, entitled "A Treatise upon Gravel and Gout," which is remarkable for containing views on the chemical nature of these diseases, not unlike those entertained by some modern pathologists. Mr. Forbes, for example, asserts that lithic (uric) acid, as it exists in the urine, must be present in the blood, although he confesses his inability to discover it. His words are, "its frequent deposition in different parts of the body affords indisputable testimony of its being contained in the general fluids;" and as this deposition occurs in certain circumstances, and more especially in gout, he makes the inquiry whether that disease may not arise in consequence of the concreting matter being redundant, or whether the coincidence is merely accidental. Mr. Forbes goes on to show the connection between gout and gravel, as exhibited in the similarity of the constitutions in which they occur, and the remedies best suited for the two diseases, comparing the depositions in the tendinous structures to the formation and separation of gravel from the urine. It should be borne in mind that this view was entertained before the discovery of the real composition of gouty deposits, by Dr. Wollas-

ton, in 1797, which accounts for the error in assuming that they contained free uric acid and not urate of soda, and of the precipitation or deposition being ascribed to the liberation of the uric acid by the aid of another acid introduced into the economy. This theory, although somewhat erroneous, approaches closely to the truth; and, considering the time it was promulgated, is characterised by great perspicuity, and was the first to give real importance to the humoral doctrine of the disease.

Notwithstanding the arguments brought forward by Murray Forbes, and the increased weight given to them by the subsequent discovery of Wollaston, the doctrines of Cullen continued to hold sway, at least in a modified form, and the late Sir C. Scudamore, up to the time of the publication of the second edition of the Appendix to his work on Gout, was inclined to favour the view which attributes the disease to a species of plethora, rather than to any alteration in the composition of the fluids; still he confessed to many difficulties in explaining the various phenomena of gout on such a hypothesis, and more especially the occurrence of chalk-stones, which he allowed were never seen except in cases of true gout; but he thought these deposits so rare, that their presence could not be employed as a basis for the construction of a general theory of the disease, and much less could the matters composing them be looked upon as its proximate cause. As regards their rarity, he remarked he had only found them forty-five times in five hundred

cases of gout, and in several of these cases many years had elapsed before any trace of such concretions manifested themselves. Sir C. Scudamore thought that so large a proportion of persons could not pass through life under the martyrdom of the disease, remaining wholly free from all evidence of the concretions, if any essential relation existed between uric acid and gout. He likewise considered that we had no proof of the existence of uric acid in the system independent of secretion, and that, even if it were present, there was no apparent cause why it should not always be secreted by the kidneys; he was of opinion that in the cases where it was thrown on the joints or other distant parts, the capillary vessels of the structures affected with gouty inflammation acted, in a greater or less degree, vicariously to the secreting vessels of the kidneys: he also stated that in several cases of extensive deposits in the hands and feet, he had by repeated experiments found a deficiency, and sometimes almost total absence, of uric acid in the urine.

At the time this opinion was promulgated there was no proof of the production of uric acid in the system independent of secretion, and the *constant* presence of urate deposits in the structures affected with gouty inflammation was likewise unknown. Having attended Sir Charles professionally in the latter years of his life, I have reason to know that his opinion on the proximate cause of gout became much altered, and he was inclined to look upon the disease

as intimately connected with the abnormal presence of uric acid in the system.

Dr. Barlow, in an article in the Cyclopædia of Practical Medicine, also supports the view of gout being closely connected with vascular plethora, and states that a paroxysm of gout can be regarded only as a constitutional disturbance of an inflammatory character, attended with local inflammation of a peculiar kind in one or more joints, running a determinate course, and in the earlier occasions terminating in health, for the most part within a few days. Recently, however, in his Manual of Practical Medicine, the author appears to have considerably altered his opinions on the pathology of gout, and now inclines to a modified humoral doctrine.

Dr. Gairdner, a few years since, advanced a hypothesis in some respects resembling those above enumerated; he believes that a general state of vascular plethora of the great chylopoietic organs is always met with in gout, as also the constant presence of a varicose state of veins of the lower extremities during an impending fit; that the heart is oppressed with a flood of returning venous blood, associated with an impure condition of this fluid from the non-elimination of urea and urates, and probably of biliary constituents. He however advances a step further than the authors before quoted, and thus describes his idea of the pathology of the gouty seizure:

"Venous congestion I consider the first condition essential to the formation of the gouty diathesis. It

is no new observation; it is found interspersed through the writings of all former authors. Even those who adopt explanations inconsistent with such a state of things, notwithstanding admit it. This state of the blood was first clearly enounced as the great cause of gout by Galen, whose opinions have continued to influence the minds of succeeding physicians in a greater or less degree, to the present day. The truth of the fact being, I imagine, unquestionable, it will always continue to embarrass the doctrines of those who advocate opinions with which it is incompatible. But the great venous canals of the body, as well as the larger arterial vessels, are endowed with a resiliency, which enables them to struggle well against the flood of returning blood. This fluid, then, is compressed between two opposing forces, that, namely, which is derived from the heart and arterial system, urging it forward on its course; and, on the other hand, the antagonistic resistance of the great veins leading to the right auricle. Under this compression I believe that the vessels give way, and a true hemorrhage is occasioned in the part affected. If the rupture takes place in a minute capillary carrying the serous portion of the blood only, œdema is the consequence; but if the burst vessel be one carrying red blood, a true ecchymosis is formed."

And again: "It will surely be admitted that the capillary and nutrient vessels, distributed on the extreme and sentient fibrillæ of the nerves, are affected in the same manner as the larger venous trunks.

believe these distended capillary vessels are the real seat and cause of the painful phenomena of gout. Is it not credible that such vessels, dilated so as to admit fluids for which they were not intended, and bound down by the firm fasciæ, in which gout has its usual seat, may give rise to much suffering?"

It will be no more difficult to refute these views of the nature of gout than the one advanced by Cullen. Let us take, for example, Dr. Gairdner's hypothesis which is the most comprehensive of the three and includes the rest, and examine it somewhat in detail. First, as regards the general state of vascular plethora of the great chylopoietic organs, which he says is always met with. In gout, especially if acquired and occurring in robust patients, a state of plethora of the abdominal organs is generally present before the attack, and there is then a fulness of the right hypochondrium and epigastrium, sluggish bowels, defective excretion of bile, and dyspepsia; but that these symptoms are constant I much question, and can bring forward records of numerous cases in which there was no evidence of any congestion of the organs connected with the portal system; such absence is more commonly seen in spare subjects and in those who strongly inherit the disease, and in whom we shall find, as we proceed further in our investigations, the kidneys rather than the liver are defective in their action.

On the other hand, if congestion of the digestive organs be intimately connected, and even a necessary

antecedent of the gouty paroxysm, how does it happen that in diseases in which these organs become loaded with blood, and in which congestion is so prominent a symptom, the sufferers are not more frequently afflicted with visitations of gout? According to Dr. Gairdner, such subjects have all the necessary elements for the production of the hemorrhage of the minute vessels of the extremities; moreover every serious disease of the heart, when that organ has become so defective in its action as to allow of congestion of the whole venous system, should, according to the above view, give rise to a paroxysm of gout. That this is seldom the case, all medical experience will confirm.

The veins leading from the inflamed part certainly become turgid at the time of the fit, and so constantly, that turgidity is one of the peculiar characteristics of gouty inflammation, but I should doubt its occurrence during the impending stage of an attack, and believe it to be the effect of some prior mischief within the joint.

Next, as to the occurrence of hemorrhage in every fit of gout, regarded by Dr. Gairdner as the cause of the local affection, and which, he thinks, will probably startle the reader by its novelty (for it must be remembered that Dr. Gairdner believes that hemorrhage will explain all the phenomena of gouty inflammation, and that it is the true *rationale*), it may be urged with fairness that the author brings forward no proof of the occurrence of hemorrhage in any

gouty fit, and hence it may be presumed he has never seen the ecchymosis alluded to; and with regard to the colourless hemorrhage or serous exudation, this occurs in numerous affections besides gout, and can be readily accounted for without assuming the very questionable existence of vasa serosa.

As the reader will perceive, by referring to the chapters on morbid anatomy, my available opportunities of examining parts affected with gout have been very numerous, but I must confess never to have seen the slightest proof of Dr. Gairdner's assertion; on the contrary, other appearances have invariably been observed which are completely pathognomonic of gouty inflammation.

If space permitted I might enter into the consideration of the opinions of many other physicians who have within the last century written upon gout, but it will suffice to do little more than enumerate the names of some of these authors. In this country Drs. Parkinson, Wollaston, and Sir E. Home, have advocated the doctrine of the humoral pathologists, and considered that a close relation existed between gout and the presence of uric acid in the blood. Others, however, as Drs. Parry and Sutton, looked upon the disease as either dependent on some peculiarity of the circulating system, or as intimately connected with disorder of the digestive organs.

On the Continent, especially in France, the views of the pathology of gout held by the most eminent writers, as Barthez and Guilbert, have been extremely

vague; the former scarcely venturing upon any hypothesis, but contenting himself with regarding gout as dependent on a peculiar disposition of the system, combined with weakness of the affected parts: the latter, explaining the phenomena by the supposition that under the influence of certain causes which impair the functions of digestion, impede the action of the skin, and give rise to a condition of plethora, a matter intended to be excreted is retained, and the lymphatic system thus becomes loaded with this, the *materies morbi*.

Other French physicians, as Cruveilhier and Dr. C. Petit, look upon gout as intimately connected with the presence of uric acid in the system, and both authors, who wrote prior to the actual proof of its existence in the blood, employ powerful arguments in support of their opinions.

Before offering to the profession my own views upon the nature of this disease, I cannot refrain from alluding to the conclusions arrived at by a physician who appears to have taken a deep and comprehensive survey of all the data which had been established at the time his article was penned; I refer to those of Sir Henry Holland, who in his Medical Notes and Reflections devotes a chapter to the subject, well worthy of attentive perusal.

Having given a slight sketch of the different ideas of the proximate cause or nature of gout, which have been entertained both in ancient and modern times by physicians whose opinions are most worthy of esteem,

and having had occasion to point out the fallacies of many of them, it now behoves me to expound the views which, from a long and attentive consideration of the varied phenomena of the disease, I have myself arrived at, and this task I will endeavour to perform in as succinct a manner as possible.

In the Medico-Chirurgical Transactions for 1848, I ventured to advance the following guarded opinion, derived from several observations on the condition of the blood and urine in gout, rheumatism, and albuminuria. "The results of these experiments on the condition of the blood and urine, prove that uric acid is not a product of the action of the kidneys, as frequently supposed, but is merely excreted from the system by these organs. They also appear to indicate that the excreting function of the kidneys with regard to the solid portion of the urine, is not a simple one, but that urea and uric acid are separately eliminated; also that one of these functions may be impaired or destroyed, the other remaining entire. It appears also probable that, as in albuminuria, the *urea-excreting* function being chiefly impaired, we find a vicarious discharge of urea in dropsical effusions; so, in gout, the *uric acid-excreting* function being defective, chalk-like deposits are produced, by a similar vicarious discharge of urate of soda.

"Gout would thus appear at least partly to depend on a loss of power (temporary or permanent) of the uric acid-excreting function of the kidneys; the premonitory symptoms, and those also which constitute

the paroxysm, arising from an excess of this acid in the blood, and the effort to expel the *materies morbi* from the system. Any undue formation of this compound would favour the occurrence of the disease; and hence the connection between gout and uric acid, gravel and calculi; and also the influence of high living, wine, porter, want of exercise, &c., in inducing it.

"This hypothesis also explains two facts, which have been regarded as militating against its humoral pathology, namely, the hereditary nature of the affection, and its frequent occurrence in low states of the system; for we can understand that the peculiarity of the kidney, with reference to the excretion of uric acid, may be transmitted, and likewise, that when the function in question is permanently injured, it will not require an excessive formation of this acid to cause its accumulation in the blood."

These views were made public fourteen years since, and subsequent clinical observations have fully confirmed their accuracy; although by themselves insufficient to explain all the phenomena of gout, still, by their aid, in conjunction with other more recent investigations, I shall be able to give a rational exposition of the disease.

In order to render my views concise and explicit, I shall present them to the reader in a series of propositions:

First, in true gout, uric acid, in the form of urate of soda, is invariably present in the blood in abnormal

quantities, both prior to and at the period of the seizure, and is essential to its production; but this acid may occasionally exist largely in the circulating fluid without the development of inflammatory symptoms, as, for example, in cases of lead poisoning, and a few other instances. Its mere presence, therefore, does not explain the occurrence of the gouty paroxysm.

Secondly, the investigations recently made in the morbid anatomy of gout, prove incontestably that true gouty inflammation is *always* accompanied with a deposition of urate of soda in the inflamed part.

Thirdly, the deposit is crystalline and interstitial, and when once the cartilages and ligamentous structures become infiltrated, such deposition remains for a lengthened time, perhaps during life.

Fourthly, the deposited urate of soda may be looked upon as the cause, and not the effect, of the gouty inflammation.

Fifthly, the inflammation which occurs in the gouty paroxysm tends to the destruction of the urate of soda in the blood of the inflamed part, and consequently of the system generally.

Sixthly, the kidneys are implicated in gout, probably in its early, and certainly in its chronic stages, and the renal affection, perhaps only functional at first, subsequently becomes structural; the urinary secretion is also altered in composition.

Seventhly, the impure state of the blood, arising

principally from the presence of urate of soda, is the probable cause of the disturbance which precedes the seizure, and of many of the anomalous symptoms to which gouty subjects are liable.

Eighthly, the causes which predispose to gout, independently of those connected with individual peculiarity, are either such as produce an increased formation of uric acid in the system, or which lead to its retention in the blood.

Ninthly, the causes exciting a gouty fit, are those which induce a less alkaline condition of the blood, or which greatly augment, for the time, the formation of uric acid, or such as temporarily check the eliminating power of the kidneys.

Tenthly, in no disease but true gout is there a deposition of urate of soda in the inflamed tissues.

With regard to the fact enumerated in the *first* of these propositions, namely, that the blood in gout always contains an abnormal quantity of uric acid during the attacks, sufficient evidence has been already afforded, inasmuch as it has been shown in Chapter IV., that in forty-seven patients suffering from the disease, the blood contained much uric acid, and subsequently to the formation of the table, an examination of the blood of at least a hundred other patients, has demonstrated the same truth. That this impregnation occurs prior to an attack, is well illustrated in the annexed case of lead paralysis, in which the patient experienced his first fit of gout when in the hospital.

Case 5, *Feb.* 15, 1859.—J. B., aged 41, an artist, engaged in painting both in water and oil colours. About ten years since felt some symptoms arising from the absorption of lead, first in the form of colic and obstinate constipation, and afterwards in the wrists. These symptoms were relieved, and he resumed his usual occupation. About three years ago he completely lost power over both his wrists, and had a severe attack of colic; he then came for the first time under my care, and by treatment was so far restored as to enable him again to pursue his avocations. Six weeks ago, he had a return of the wrist-drop and colic, which have continued up to the present time. There is now an entire loss of power in both wrists, also considerable wasting of the extensor muscles of the fore-arms, and of the flexor muscles of the right thumb; severe twisting pain around the umbilicus, and constipated bowels, loss of appetite, and weak pulse. A very distinct blue line is seen on the free edge of the gums, both of the upper and lower jaw.

A small amount of blood, obtained on admission into the hospital, exhibited the following characters:

Clot firm, and slightly buffed; serum, yellow, transparent and alkaline. Sp. gr. 1027 at 60° Fahr. By the thread experiment there was evidence of its containing abundance of uric acid.

Urine pale, free from deposits, and yielding scarcely a trace of uric acid when acidulated.

During his stay in the hospital, this patient expe-

rienced a decided attack of gout, first in the metatarso-phalangeal joint of the left great toe, and afterwards in the corresponding joint of the right foot.

That in certain instances the blood may contain an abnormal amount of uric acid without the occurrence of gouty inflammation, evidence has been afforded in some cases of lead-poisoning, and others will be alluded to subsequently.

In the Chapters on the Morbid Anatomy of Gout, I believe sufficient evidence will be found to convince any pathologist of the truth of the *second* proposition; for not only has proof been afforded that a deposition of urate of soda occurs in the chronic forms of the disease, but even that the slightest amount of gouty inflammation is accompanied with a similar deposit. Its presence has been discovered in a case in which only one small joint had been affected, as also in a knee-joint, known to have been but once inflamed, and that very slightly, and, since the publication of the first edition of the present work, in a case where only one attack of gout had at any time occurred. This fact I wish to impress forcibly on the minds of my readers, because in the constancy of such deposition, lies the clue which has long been wanting: the occurrence of the deposit is perfectly pathognomonic, and at once separates gout from every other disease which at first sight may appear allied to it.

To my *third* proposition, little further need be added, as I have already stated that in very numerous

instances I have found the cartilaginous and ligamentous deposit distinctly crystalline, and undoubtedly interstitial, and with respect to their long persistence when once deposited, I can bring forward strong evidence. In Case 15, Chapter vi, where only the ball of one great toe had been implicated, two years had elapsed, still the deposit was discovered; at least an equal time had elapsed in Case 13, where the knee had been but once and very slightly inflamed, yet distinct evidence of the mischief remained; in Case 16, in which only one attack of gout had occurred, we have proof that after an interval of thirteen years the cartilages and ligaments still remain infiltrated with the crystalline urate of soda. In the majority of cases the deposits probably remain during life, increasing more and more, at each succeeding fit of the disease.

It is of the highest importance to establish the truth of the *fourth* proposition, namely, that the deposited urate of soda must be regarded rather as the cause than the effect of the gouty inflammation, inasmuch as it bears closely upon the pathology of the disease, but there are at the same time certain attendant difficulties in the inquiry. There are several reasons which militate strongly against the supposition of the deposit being the effect of the inflammation; for instance, when tissues little liable to take on inflammatory action become infiltrated, but slight vascular disturbance is produced; this is especially the case with the fibro-cartilage of the ear; and,

although we now and then meet with patients aware of the formation of these little nodules, who experience, in fact, a gouty fit in the ear, yet in the majority of cases attention has never been directed to the part, so slight has been the inflammation caused by the effusion.

Another reason, strongly against the same supposition, is the statement contained in the *fifth* proposition, to be now considered, namely, that the inflammation of gout tends to the destruction of the urate of soda in the blood of the part. The proof of this is to be seen, first, in the fact that the serum effused by the application of a blister to the inflamed part does not exhibit evidence of containing uric acid, when the blood of the patient and the blister serum from another portion not so inflamed readily shows its presence: and secondly, in the peculiar situations and manner in which these depositions occur, selecting for example structures possessed of slight vascularity, as cartilage, fibro-cartilage, ligament and tendon, and the surface of synovial membranes, and, even in these tissues, keeping to such portions of them as are furthest removed from the influence of blood-vessels. Thus the deposit in articular cartilage, although completely interstitial, first takes place at the free surface, and very gradually travels inwards towards the bone. The only marked exceptions I have seen to this rule, have occurred in the patella, in which occasionally nodules of urate of soda are observed at some distance from the articulating surface, often close upon the osseous

tissue; but we must remember that the patella is a sesamoid bone, and by no means vascular in its structure; this may probably account for the fact that Cruveilhier discovered deposits which he considered to consist of urate of soda, even within the patella itself.

We have likewise seen that on the surface of bones much altered by gout, especially the condyles of the femur, the deposit avoids the continuity of the vascular fringes of the synovial membrane; a fact first pointed out by Dr. W. Budd, and seen in the delineation of the knee-joint, in Plate III., fig. 1.

Lastly, the results of certain physiological experiments in which uric acid has been injected into the blood, as also the readiness with which it is decomposed out of the system, confirm the idea that contact with blood-vessels, more especially when in a state of inflammation, has a tendency to cause the destruction of uric acid.

It would thus appear that the gouty fit is, to some extent, a salutary process, ridding the system of much uric acid which may have been accumulating for a considerable time; but we must likewise remember that it is always attended with a certain amount of local mischief, which may or may not prove of subsequent inconvenience.

The truth of the *sixth* proposition has been fully demonstrated in Chapter vii, where it has been shown that with very few exceptions, in subjects who had in any degree suffered from gout, the kidneys were altered by the deposition of urate of soda, both at the ends of

the pyramids and in the direction of the tubuli uriniferi; that in many instances these organs were contracted; and in almost all, an appreciable change had ensued in the cortical structure. It has been imagined long since that the kidneys are affected in gout; Morgagni, for example, had an idea that we should find a clue to the disease in the condition of these parts, and many of the writers before quoted have looked upon the kidneys as implicated in conjunction with the other abdominal viscera.

The effect of gout in altering the renal secretion has likewise been fully proved, the uric acid excretory function shown to be defective, and the urine itself often to contain a small amount of albumen. The imperfection in the eliminating power of the kidneys is sometimes the chief, if not the only cause of the impure condition of the blood; for to demonstrate that an augmented formation of uric acid in the system is not necessarily accompanied with an excess in the blood, we need only refer to the case of birds, in which the whole of the nitrogen is metamorphosed into uric acid, and yet the blood remains pure. In proof of this I may mention, that in several instances I have examined the blood of the turkey, duck and pigeon, and have always found it quite free from an excess of uric acid.

The *seventh* proposition is difficult to prove, although almost every physician is accustomed to recognise a close relation between particular symptoms and the presence of certain morbid matters in the blood. We

have absolute proof, derived both from physiological and pathological observation, that when the urinary secretion is completely stopped, most serious and even fatal symptoms ensue; and it is therefore reasonable to suppose, that if one or more of its constituents be retained in the blood, certain morbid phenomena would result therefrom. Some of these symptoms in the case of gout may arise simply from the presence of the special impurity, others possibly from an attempt at its deposition, and the consequent reaction. I should be inclined to regard the dyspeptic symptoms which usually precede the gouty fit as due to the former, and many of the anomalous and irregular forms of the disease which we shall hereafter more fully consider, as dependent rather upon the latter cause.

The discussion of the *eighth* proposition is of much interest and considerable importance, for if we can prove the truth of the statement that the predisposing causes are of different kinds, one leading to the increased *formation* of the morbid matter, the other to its *retention* in the blood, we at once have a clue to the varieties of the disease, popularly known as the rich, and the poor man's gout. As it has been shown that the inflammation is invariably accompanied by the deposition of urate of soda, which may be regarded as its cause, it is evident that any circumstance which favours an accumulation of this salt in the system, and thereby paves the way for its infiltration into the articular tissues, becomes a predisposing cause,

whether this arises from its augmented formation and the consequent overtaxing of the renal organs, or whether the excreting power of the kidneys be simply impeded in their normal function. It appears probable, that in the majority of cases of gout, both causes are in operation; but on the other hand it is easy to conceive that either, if active, might lead to the production of the disease. In the former case the affection would be typical of the rich man's gout, in the latter, of the poor man's.

In the *ninth* proposition we have assumed that the infiltration of urate of soda into the tissues may take place in two ways, either by its great accumulation in the blood, or by that fluid being rendered less capable of holding it in solution; the former condition may be caused by a temporary increase in the formation of uric acid, as by aggravated dyspepsia, from partaking of very indigestible articles of diet; or by a sudden loss of the uric acid-excreting power of the kidneys from mental shocks, severe accidents, and so forth, all of which we know to be very potent in exciting a fit of gout; the latter condition is likely to be induced by partaking of acid liquors, as particular kinds of wine, hard beer, and pickles, or by the suppressed action of the skin causing defective elimination of the normal acid secretion, and the consequent diminution in the alkalinity of the blood.

The serum, in which the urate of soda is dissolved, is alkaline, and this reaction is caused in part by phosphate of soda, in part by alkaline bicarbonates.

In no case of disease—and my opportunities have been numerous—have I found this fluid acid, and it is probable that such a state would be incompatible with life; but there is often a marked alteration in the degree of its alkalinity, and in many cases of chronic gout it has shown a near approach to neutrality. Any diminution in the alkaline state of the blood lessens its power of holding urate of soda in solution, and hence promotes its deposition, especially in tissues in which the reaction is naturally less alkaline than in the blood. To illustrate this experimentally, we may take a watery solution of the common phosphate of soda, and dissolve uric acid in it, but only to such an extent as to ensure the fluid remaining alkaline; a diminution of this reaction by the subsequent addition of a weak acid, will cause the precipitation of urate of soda; but if the fluid is rendered acid, crystallisation of free uric acid will ensue.

By the adoption of these views we are enabled to explain why differences exist in the classes of exciting causes; for we have found that some of them are of the same nature as those which predispose to gout, but that others, however long their action is continued, are powerless as predisposing agents. We now see the reason of these differences; those agencies which, when in active operation, lead to a rapidly augmented formation of uric acid and the production of a fit, must necessarily, if in slower action, predispose to the affection; whereas agencies which simply diminish the alkalinity of the serum, and render the

urate less soluble, cannot of themselves in any way produce the disease; thus cold, which so often excites a fit of gout, never induces a gouty habit.

We have lastly to discuss the *tenth* proposition, namely, that in no other disease but true gout is there a deposition of urate of soda in the inflamed tissues. In at least a dozen cases of patients who had suffered from genuine rheumatic fever, I have examined some of the joints known positively to have been affected. Some of the joints, recently inflamed, have exhibited increased vascularity, turbidity of the synovial fluid, opacity of the cartilage, and other marks of inflammatory action; but in no one case have I seen the slightest deposit of urate of soda. Again, in numerous cases of rheumatoid, or chronic rheumatic arthritis, observed both by myself and others, although the cartilages have always shown signs of much injury, from the effects of ulceration, yet no urate deposit has been found. I may here state that it has been asserted that urate of soda is sometimes present in joints which had not been affected with gout during life, and one such case is related by Mr. Barwell, who exhibited very recently a diseased knee-joint, supposed to be in this condition, before the Pathological Society; but on careful examination I found that the deposited matters, which had replaced to some extent the absorbed cartilage, consisted of phosphate and carbonate of lime, without a trace of uric acid. In an examination of the great toe joints, in at least forty cases, I have known only two instances in which uric

acid has been discovered, and in both these it occurred in one foot only, and was limited to a single spot in the cup of the first phalanx. One of these individuals had been a cabman, aged forty-eight; had granular kidneys, and had died from an injury; the other was a man aged forty-three, who died from delirium tremens; in both cases the spot was similarly situated, as represented in the annexed woodcut. I have no doubt that many persons experience extremely slight attacks of gout before the development of the affection in an acute form, and several patients have assured me that for years before their first severe attack in the great toe, they have experienced slight twinges, which have occurred periodically. I am quite of opinion that when such twinges occur, deposition has already taken place.

Fig. 30.*

Having enumerated and considered these propositions, we will next endeavour, by their aid, to explain certain peculiarities which are met with in the progress of gout, many of which have proved of great difficulty to pathologists; and first, with regard to the phenomena of the fit. It is essential for its production that there should be an impure condition of the blood from the presence of urate

* Fig. 30 represents the cup of the first phalanx of the great toe containing a speck of urate of soda; from a man who died of delirium tremens.

of soda, and such impurity may be induced by the action of any of the predisposing causes of the disease, and is probably of itself sufficient to give rise to the premonitory symptoms which are chiefly manifested in the functional derangement of the digestive and circulating organs. To excite a gouty paroxysm, however, requires the additional operation of other agents, namely, of those by which the urate of soda is either suddenly augmented or rendered less soluble, and its crystallisation consequently promoted in the ligamentous and cartilaginous structures of the joints. The intensity of the pain which usually accompanies a gouty fit depends upon the rigidity of the parts, or the state of tension within the joint, for it is only when the inflammation is inter-articular, that it is so peculiarly intense; when confined to the more superficial structures around the joints, the pain in gout has not appeared to me to be more severe than that which occurs in many other inflammatory diseases.

A peculiarity of gouty inflammation, described in our second chapter, is the occurrence of œdema, and the subsequent desquamation of the cuticle; these symptoms are of some importance, as they are so frequent in gouty, so rare in rheumatic inflammation. An explanation has been before hinted at, namely that the œdema depends on the presence of urea in the blood, and we have seen that this is frequently the case, and likewise know that in albuminuria, where the elimination of urea is greatly impeded, œdema becomes a prominent symptom; and in scarla-

tina, where the kidneys are so liable to be affected by the poison, desquamation of the skin is a characteristic attendant. I cannot help thinking that the above may be the true explanation; but in order to prove it beyond doubt, certain clinical and chemical observations are required which have not yet been satisfactorily made. The occurrence of chalk-stones, or gouty tophi, which has so long been a stumbling-block to those who denied the existence of an altered blood, is now easily explained; *every paroxysm of gout is attended with a deposit.*

Sir Henry Holland remarks that a difficulty in the history of gout, and one not easily reconcilable with the view of the disease being dependent on a *materies morbi*, is the fact of the frequent attack of some joint with gouty pain and swelling, without any well marked symptoms to give warning of its approach; for it is necessary to explain how the matter, capable by accumulation of producing an attack, should have been dormant up to the time of the seizure, and why, latent thus long, it should suddenly show itself in the production of acute disease. These questions he confesses could not be answered at the time he wrote.

According to our view their solution is a very easy task, for we have shown that the mere accumulation of the urate is quite unequal to the production of inflammation, and that its actual deposition in tissue is essential, an occurrence which usually requires a peculiar exciting cause; and hence in many cases there may be no well marked symptoms to give warning of

the approach of a fit, and hence also the poison may lie dormant for a considerable time, but when crystallisation of the salt takes place in any tissue, inflammation is suddenly lit up by its presence, and a paroxysm of gout ensues.

Questions in the history of gout of much greater difficulty to solve, are the following:—

Why does gouty inflammation in its earlier attacks peculiarly select the ball of the great toe? and why, in the subsequent progress of the malady, are the affected joints more numerous?

To answer the first of these questions has been the attempt of many physicians; Sydenham says "the feet are the genuine seat of the peccant matter, which may without doubt fix itself on other parts; but in that case it is plain that either the progress of the distemper is inverted, or the patient's strength, from repeated attacks, is gradually impaired."

Boerhaave has an aphorism to this effect, that the part which gout first and regularly attacks is always the foot, and chiefly those tissues which the fluids have most difficulty in passing through, as the periosteum, tendons, nerves, membranes, and ligaments, and such as are most remote from the heart, and most pressed upon and injured. His commentator, Van Swieten, adds, that considering the difficulty with which the liquids pass through these parts, no improbable notion may be formed why gout is generally observed to commence in them, as they suffer great pressure from having to sustain the weight of the

whole body, and being far removed from the heart are subjected to the action of cold and moisture, and the blood brought to them by the arteries, when returning through the veins, has the force of gravitation to overcome. The feet are also peculiarly liable to be hurt in walking, leaping, sudden falls, and accidents.

I believe there is much truth in these remarks of Boerhaave and Van Swieten, although the state of pathology at that period did not allow them to advance further in explanation of the subject.

There are many circumstances which cause the great toe to be selected for the first deposition of gouty matter; it contains, for example, in abundance, the tissues particularly prone to be affected, namely, those either of little vascularity, or nourished altogether independent of blood-vessels; it is likewise very remote from the heart, where the force of the circulation is at its minimum; in addition to this, the metatarso-phalangeal joint is one which is subject to pressure and injury from having to support the weight of the body.

In connection with this point I may mention that in the examination of this joint in many individuals who have never experienced symptoms of gout, I have commonly found distinct evidence of injury on the surface of the cartilage, both of the head of the metatarsal bone and of the cup-like cavity of the phalanx, when these appearances were not present either in the corresponding joints of the other toes, or in any of the phalangeal articulations.

Very recently with the aid of Mr. Wilmot Power of University College Hospital, I have been enabled to obtain some definite numerical results on this subject. Besides the several cases just mentioned, of which the general impression only is recorded, the condition of the great toe joints was carefully noted in twenty cases in which no gout had existed; in six only were both joints found absolutely healthy; one toe was healthy in three cases; but in the remaining eleven cases, both toes were affected with ulceration of the cartilage to a greater or less extent. The following tabular arrangement shows the principal points of interest:—

Case.	Sex.	Age.	Condition of Metatarso-phalangeal joint of great toe.
1.	Female . .	67	Right, healthy. Left, slight ulceration in cartilage of cup with a small yellow spot (fat).
2.	Female . .	53	Right, faint ulceration in cartilage of cup. Left, fainter.
3.	Female . .	62	Right, trace of ulceration in cartilage of cup. Left, scarcely a trace.
4.	Female . .	64	Right, faint ulceration. Left, faint ulceration.
5.	Female . .	24	Right, healthy. Left, healthy.
6.	Female . .	61	Right, very slight ulceration of cartilage of cup. Left, one quarter of articular surfaces, denuded completely of cartilage.
7.	Female . .	64	Right, healthy. Left, small but deep denudation of cartilages of cup.

Case.	Sex.	Age.	Condition of Metatarso-phalangeal joint of the great toe.
8.	Male . . .	33	Right, faint ulceration of cartilage of cup. Left, healthy.
9.	Male . .	46	Right, some ulceration of cartilage of cup. Left, ulceration more marked.
10.	Male . . .	48	Right, healthy. Left, healthy.
11.	Male . .	29	Right, healthy. Left, healthy.
12.	Male . . .	54	Right, cup and head ulcerated to the same extent. Left, the same.
13.	Male . .	38	Right, healthy. Left, healthy.
14.	Male . . .	42	Right, small spot of ulceration at outer edge of cup. Left, commencing ulceration.
15.	Male . .	52	Right, oval ulceration in cartilage of cup, and small ulceration of head of bone opposite that in cup. Left, slight ulceration in cup.
16.	Male . . .	34	Right, very faint ulceration of cartilage of cup. Left, slight ulceration of cartilage of cup.
17.	Male . .	47	Right, extensive and well marked ulceration of cup. Left, slight ulceration of cartilage of cup.
18.	Male . .	31	Right, very faint ulceration of cartilage of cup. Left, slight ulceration in cartilage.
19.	Male . . .	26	Right, healthy. Left, healthy.
20.	Male . .	34	Right, healthy. Left, healthy.

Lastly, we know that certain poisons are, as it were, attracted to particular parts, and the external phenomena displayed by their action are usually symmetrical. This is exemplified in many cutaneous

affections. The same power of selection is shown in the action of many drugs; thus digitalis acts on the heart, opium on the cerebrum, and strychnia on the spinal cord.

In answer to the second question, why numerous joints are implicated in advanced gout; the following appears to be the probable explanation. When the disease becomes engrafted into the system, the amount of urate of soda in the blood is augmented, and requires more surfaces upon which to deposit itself, and hence other joints in addition to the great toe are selected; moreover, the cartilages and ligaments of the joints first attacked, after a time become completely incrusted, so much so indeed that the ball of the great toe is in many cases anchylosed, and converted into a solid case of urate of soda, so that no further deposit can take place in it.

It is interesting to observe the regularity with which, under ordinary circumstances, the joints are implicated. First the great toes, then the heels, and ankles, afterwards the knees, the smaller articulations of the hands, the elbows, and lastly the shoulders and hips. There are it is true many exceptions to such a sequence, but these can usually be accounted for by the occurrence of blows, sprains, or other injuries. It will be observed that this order has a close relation to the conditions which favour the deposition of the urate of soda; for example, the heels and ankles are much exposed to pressure, and are also remote from the heart; the knees are likewise under somewhat similar circum-

stances; the hips and shoulders, the least frequently affected, are the joints in which the circulation is most active, as they are near the large arterial trunks, and the obstacles to the return of venous blood from them are slight; they are also protected by thick coverings of muscular tissue.

When deposits are formed in the more external parts of the body, those are commonly selected in which the circulation is sluggish; thus we have found the helix of the ear to be a favourite point, and probably this organ is colder than any other portion of the frame. I have before mentioned that in my experience, when patients have had chalk-stones about the joints and not in the ears, these latter were warmer than usual: I do not remember ever having seen them in the ears of women. May not this arise from their being generally kept warm by some covering?

The next question which naturally arises in the course of our inquiry is, Why do deposits of urate of soda constantly take place in ligaments and cartilages, or closely allied tissues? One reason may be that these structures possess but little vascularity, and the deposit is at once placed beyond the further influence of the blood-vessels, but, in addition to this, it is probable that the fluids of these tissues are less alkaline than those of many others, and certainly less alkaline than the blood itself. Sometimes, in old gouty cases, only a few hours after death, the reaction of the synovial fluid in the joints becomes distinctly acid, but that this is not constant, will be

seen in the accounts of several of the dissections in Chapter VI. These two circumstances, the slight vascularity of the tissues and the diminished alkalinity of the fluids, probably explain why such parts are more frequently attacked than others.

Why are females comparatively exempt from gout, at least in its more regular manifestations, and why does the disease so seldom attack young people? These questions can be readily answered. Women, although liable to the influence of hereditary predisposition, are to a great extent free from the action of many of those extraneous causes which both induce and excite gout, more especially excesses in wine and malt liquors; in addition to which they partly owe their immunity to the occurrence of the catamenial discharge during many years of adult life, which constantly tends to rid the system of superfluous blood without engendering debility. It is after the cessation of this function, or when it has become arrested by accidental causes, that gout is most apt to develope itself, and the aphorism of Hippocrates already referred to is practically correct. During youth, when the growth of the body is rapidly advancing, and excess of nourishment is required to build up the frame, and while the secreting functions are in full activity, there is little tendency to engender such a state of blood as would lead to the development of gout, and youth moreover is seldom subject to many of the predisposing causes of gout.

It would thus appear that hereditary predisposition

alone is unequal to cause the development of gout, and there are many examples on record of men strongly inheriting the affection, passing through life without an attack of the disorder; but in them, as well as in women, it is common to find strong evidence of their constitutional tendency in the manifestation of many symptoms of the masked forms of the disease; the same is occasionally witnessed in young people.

Lastly, it may be asked, Why does gout almost invariably recur, and why does it at first exhibit signs of periodicity in its returns?

These phenomena are explained by the fact, that in gouty subjects an impure state of the blood is generally present, arising either from an increased formation of uric acid in the system, or from its defective elimination; when, therefore, any exciting cause is more than usually active, a fit is at once induced; in the early stages this usually happens in spring or in autumn, when the circulating and secreting organs are peculiarly prone to sudden derangements, but after a time the seizures become more frequent, and are brought on by the operation of the slightest irregularities. Now and then only a single fit occurs during life, but such cases are quite exceptional. In individuals not hereditarily predisposed to gout, great care in diet and regimen, and a completely altered course of life will sometimes prevent a further recurrence, even after several attacks have been experienced.

CHAPTER X.

TREATMENT OF GOUT:—SHORT REVIEW OF THE TREATMENT ADOPTED BY THE ANCIENTS—IS GOUT A CURABLE DISEASE?—CULLEN'S OPINION—AUTHOR'S VIEWS ON THE VALUE OF REMEDIES IN THE DIFFERENT STAGES OF GOUT—TREATMENT OF ACUTE GOUT—DIET AND REGIMEN—THE VALUE OF PURGATIVES—MERCURIALS—THEIR INJURIOUS EFFECTS IN MANY CASES—DIURETICS AND DIAPHORETICS—BLOOD-LETTING—COLCHICUM—LOCAL TREATMENT—LEECHES—BLISTERS—WARM APPLICATIONS—EVAPORATING LOTIONS—ANODYNES—SUMMARY OF THE TREATMENT OF THE GOUTY PAROXYSM.

THE general plan of treating gout adopted by the ancients has been already sufficiently indicated in our introductory chapter, from which it may be gathered that physicians of olden times had recourse to free depletion by the use of bleeding, purgatives, and emetics, and often combined with these, the employment of the hermodactylus; at the same time they enforced abstinence in diet, especially at the commencement of the paroxysm. They also had recourse to local appliances, as scarifications, fomentations, and emollient ointments. During recovery a more generous diet and stomachics were allowed, and friction of the affected joints frequently enjoined.

These remedial methods were doubtless founded on their ideas of the nature of the disease and the best means of getting rid of the offending matter from the

system, but the heroic plans adopted, however available at that time, would certainly ill-suit the gouty of the present generation, for whom we must now endeavour to point out the means most likely to conduce to the alleviation and cure of their sufferings.

Is it possible to cure gout? is an inquiry not unfrequently made, and the conclusion generally arrived at is by no means satisfactory either to patient or physician. An opinion has long prevailed, not only among the public but likewise in the profession, that gout is altogether an incurable malady; that gout alone is the cure of gout, or in other words, that a fit of the disorder is essential to rid the system of the impurities which have led to its production. Such an idea probably arose from the remarks contained in the writings of some of the ablest physicians upon this subject; in the works of Sydenham, we find the following passage; "In gout, it seems as if it were the prerogative of Nature to exterminate the peccant matter after her own fashion, to deposit it in the joints, and afterwards to void it by insensible perspiration;" and Cullen, looking upon gout as a disorder of the whole habit, and often depending on original conformation, considers it probable that it could not be cured by medicines, the effects of which are always transitory, and seldom extend to the production of any material change in the economy. Cullen also considers that it would perhaps have been fortunate for gouty persons had this opinion been implicitly received by them, as it would have prevented their becoming

so often the dupes of quacks, who either trifled with inert medicines or rashly employed those of a pernicious tendency.

Although individuals, originally possessed of strong constitutions, now and then experience periodic attacks of gout, sometimes for more than half a century, without appearing to be materially injured by their occurrence, yet such cases form the exception to the general rule, which is for the disease to become more chronic in its nature, for depositions of urate of soda to increase both in and around the joints, producing stiffness and deformity, and for the eliminating power of the kidneys to become gradually less efficient. It is true that a patient often feels much relieved after a severe fit of gout, for the system by this means has rid itself in a great measure of impurities which were previously causing many distressing symptoms; a fact which gave rise to the opinion of Sydenham, that the more violent the inflammation the shorter the paroxysm, and the longer the interval between it and the next.

But we have already seen that gouty attacks, although they may be in a certain degree regarded as curative, are also destructive, and that a deposition of the morbid principle invariably occurs in the inflamed joint, henceforth to act in some degree as foreign matter, and not unfrequently to lead to ulterior mischief. This view of the pathology of gout being established, it is only reasonable that our endeavours should be directed to prevent the formation, and aid

the expulsion, of the impurities by other channels than the articular surfaces, and not to encourage the fit, as has been sometimes advised.

My own opinion as to the value of treatment in gout, derived from an extensive experience, is—

First. In the acute form, gout is as controllable and as much under the influence of remedies as any other inflammatory affection. At the same time I wish to lay great stress upon the nature of the treatment, feeling fully convinced that, not only the duration of the paroxysm, but likewise the injury inflicted upon the joints, depends upon its judicious administration.

Secondly. The more chronic forms of gout, which are met with in every degree of severity, are likewise under the control of the physician, if not for their radical cure (and this can scarcely be looked for when crippling of the joints and extensive deposits have already occurred), yet for so much relief as will enable the patient to enjoy life, and prevent the further increase of mischief, which is so prone to ensue, if the disorder be allowed to run its own course, and more especially if recklessly tampered with.

Thirdly. As gout is a disease which is not only apt to return with increased severity, but to acquire a firmer hold on the constitution at each visitation, it is a matter of serious moment to consider whether it may not be prudent in the intervals of the attacks, not only to regulate the diet and regimen of the sufferer, but even occasionally to have recourse to some

means, scarcely to be called medicinal, by which the blood may be kept free from those impurities, which by their accumulation lead to the production of the paroxysm.

The treatment of gout founded on Cullen's aphorism of trusting to patience and flannel is to be highly deprecated. It may indeed be argued, that it is the natural treatment and that Nature is a sure guide, but it must be remembered that man living in a civilised state is not in a normal condition or in all probability he would never have acquired the disease, and that when suffering from a disorder so acquired, he must be content to have recourse to artificial remedies. If he could entirely lay aside his usual habits, and follow in all respects the dictates of nature, there would probably be little need to seek relief from medicine.

I shall endeavour to point out the means best suited for the majority of patients in the different stages of gout; but all who have had experience in clinical medicine must be fully aware, that each individual case not only exhibits its own peculiarities and becomes a separate study, but likewise demands, in certain respects, a special treatment. The neglect of this consideration, which is apt to lead to a routine practice closely bordering on empiricism, has thrown no little obloquy on the science of medicine.

Treatment of Acute Gout.—When called to a patient suffering from an early and acute fit of gout, we should follow the rules which apply to the treatment of ordi-

nary inflammation of equal intensity, always bearing in mind that we are dealing with a disease originating in a peculiar condition of the system, which is capable of considerably modifying the various symptoms that may present themselves. Except under peculiar circumstances, a strict antiphlogistic diet should be enforced, but as the appetite is sometimes keen, this cannot on all occasions be easily accomplished. Experience convinces me that in many instances a fit of gout is prolonged to an unnecessary degree from sufficient regard not being paid to this point, and many patients have informed me that, whereas under a regimen in which animal food was allowed, they were accustomed to suffer many weeks from each paroxysm; under a properly restricted diet their attacks have passed off in an equal number of days. The error of allowing animal food in such cases has arisen not only from a wish to gratify the patient's appetite, but from a very prevalent idea, that it is of importance in gout to guard against the occurrence of debility, and that a nutritious diet is necessary to secure this end. On consideration, however, it must be evident that the lowering of the system induced by the long continuance of inflammatory disease far exceeds any trivial debility which can possibly be caused by the necessary abstinence; moreover, in most patients thus circumstanced, although appetite be present, the digestive powers are weakened, and animal food taken at such times aids greatly in augmenting the impurity of the blood, and consequently increasing the gouty condition of the

habit; in addition to which, such a diet has a tendency to keep up a febrile state of the system.

The rules of diet in cases of acute sthenic gout may be thus shortly summed up. The patient should be confined to a diet consisting of little more than diluents and farinaceous food, until the disease has shown a decided inclination to abate, indicated by diminished tension of the skin, mitigation of the pain, and the ready production of pitting. Such a diet would include bread, arrowroot, sago, tapioca, and the like, with milk, thin gruel, barley, or toast and water, and weak tea. The drinking freely of diluents is of advantage, as it keeps up the action of the skin and kidneys, but stimulating or alcoholic beverages should be strictly forbidden, or the fit may be greatly prolonged; as an instance I may mention that a lady once informed me that she had suffered from an attack of gout for the space of six months, and the only cause to which such a lengthened duration could be attributed was the circumstance of her having taken two or three glasses of port wine every day, to combat a feeling of great prostration.

Now and then, it is true, circumstances arise which render it advisable to relax somewhat, but I am convinced that in acute gout their occurrence is rare, and we should not too readily be led to deviate from the prescribed plan from the mere sensations of the patient, but be guided by the state of the pulse and other objective rather than subjective symptoms. When the febrile disturbance has abated and the

local affection has become distinctly relieved, a return to a more nutritious diet may be allowed, taking care that nothing likely to cause indigestion be given; beef-tea at first, and then white fish, afterwards fowl or tender meat, but this latter in moderation, for we must remember that everything beyond what is absolutely required for the nourishment of the body only feeds the disease. Even at this stage it is usually imprudent to have recourse to alcoholic stimulants, but if really necessary to promote digestion, a very small quantity of brandy may be given, freely diluted either with plain or aërated water; hollands or whiskey, if preferred, may be substituted for brandy. If wine be taken, a little sound sherry is most suitable, but we must remember that wines of all kinds possess a much greater power both of inducing and exciting gout than distilled spirits. Malt liquors should be altogether prohibited, as especially prone to cause a recurrence of the paroxysm.

When febrile disturbance is present to any extent in acute gout, the patient should keep his bed at least for a day or so, as too early exposure and exertion sometimes cause the inflammation to leave the joints and implicate more important organs, and instances of this kind in which the brain has thus become affected, and delirium produced, are not uncommon. On the other hand, too much warmth and inactivity is decidedly injurious, inducing debility, and preventing the due action of the various organs of the body. In former times many advocates were found for

attempting to drive off the paroxysm of gout by extreme exertion; this may perhaps be sometimes successful when a mere threatening exists, but not when inflammation has established itself. On the subsidence of the fit, moderate and gradually increased exertion is of much service, and likely to prevent the injured joint from remaining stiff and weak.

The medicinal treatment of gout may be divided into the general and local.

The constitutional treatment should be directed to the diminution of inflammation and febrile disturbance, and the restoration of the blood to a healthy condition. To effect the first of these objects the methods employed to subdue ordinary inflammation may be resorted to, as keeping up the secretions from the different organs by purgatives, saline diuretics and diaphoretics; diminishing the force and frequency of the pulse by vascular sedatives; and alleviating the pain, if necessary, by the use of anodynes. The second object is best attained by giving remedies which have a special influence upon the composition of the circulating fluid.

We will now endeavour to point out the value of the several means which have been employed in combating a fit of gout, but it must be remembered that our remarks on some of the special remedies will not be confined to their use in the acute attacks of the disease.

Purgatives.—Some physicians have altogether con-

demned the use of purgatives in gout, others have been loud in their praise. Among the former may be mentioned Sydenham, Mead, and Boerhaave; among the latter, Hoffman, Sutton, and Sir C. Scudamore. Sydenham carried his idea of the danger of purgatives in gout to an extreme, as will be seen in the following passage from his Treatise. "Sure I am that all purging, mild or sharp, intended to relieve the joints, is mostly injurious, whether it be during a fit to diminish the peccant matter, at the end of one to dissipate the remnants of the disease, or during an intermission to guard against the occurrence of one. From myself and others I have learnt that purges bring on what they were meant to keep off." He then goes on to explain how purgatives act injuriously under these different circumstances, and how in his own person they had completely failed to accomplish the desired object, and he asserts that he has known persons persevere in this method most rigorously, and yet continue to suffer from gout in its most aggravated forms. Sir C. Scudamore, on the other hand, acting upon the indications suggested by his own view of the nature of gout, and considering that it was closely connected with portal congestion, gave purgatives very freely, and more especially those which produced a cholagogue effect. He commonly employed a combination of calomel, antimonial powder, and the compound extract of colocynth, repeating it each night or every second night, according to the character of the evacuations and the advantages which appeared to be

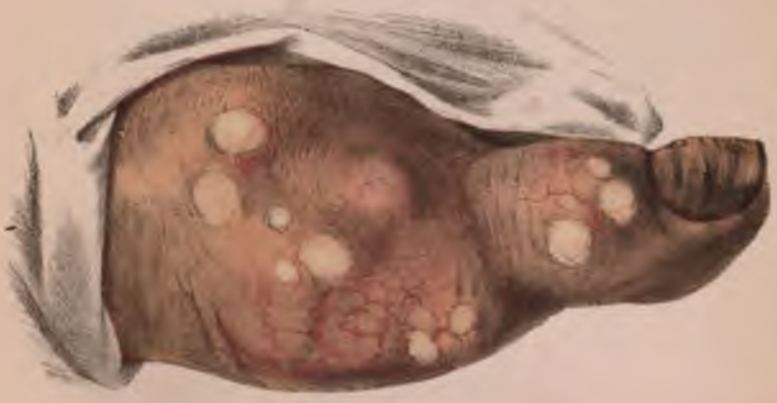
derived from the treatment; along with these he was in the habit of ordering a draught containing sulphate of magnesia, burnt magnesia, and the acetic extract of colchicum, which had the effect of keeping up the action of the bowels.

In speaking of the value of purgative medicines in the treatment of gout, I purposely exclude the preparations of colchicum, not that colchicum does not act as a powerful cathartic, but because it certainly does not owe its efficacy to this property, and frequently proves of most benefit when its operation is unattended with increased alvine evacuation. My own experience has taught me that in the acute stages of the disease, purgatives possess no peculiar power of lessening the articular inflammation, and can therefore in no way be depended upon for effecting this object. I am induced to make this remark, being aware that some practitioners look upon the curative action of colchicum as due to its cathartic properties, and have an idea that a like amount of purgation excited by other remedies would answer the same purpose. Of the incorrectness of this opinion I am fully convinced from repeated clinical observations, and from the results of trials made to determine this point, which will be related when we are discussing the therapeutic powers of colchicum.

Purgatives given in moderation are undoubtedly of value in many cases of acute gout, more especially, when accompanied with constipated bowels, retention of the bile, and hepatic congestion; but their

efficacy under such circumstances simply depends on their power of restoring, to a healthy state, functions previously deranged, and not on their producing any specific effect either upon the affection of the joints or the state of the blood. It is very questionable if the secretion from the mucous membrane of the bowels induced by the operation, even of hydragogue purgatives, contains uric acid, and certainly not sufficient to relieve in any sensible degree the overloaded state of the blood: in gout we can neither reasonably hope for, nor do we find, from the action of hydragogues, the relief which so frequently follows their administration in cases of albuminuria, or in anasarca dependent on cardiac disease. On the other hand, purgatives if given in doses sufficient to cause much depression are decidedly injurious, for although perhaps some temporary mitigation of suffering may be afforded, yet the disease is rendered more liable to recur and to assume a chronic and asthenic form. The amount of cathartism must be determined by the peculiarities of the individual case, for that which in one would not be followed by appreciable inconvenience, in another may be attended with serious prostration.

The kind of purgatives most suitable to the treatment of gouty inflammation, must also depend on individual peculiarities; if mere constipation exists without sensible derangement of the hepatic function, the simple laxatives or milder cathartics may be employed, such as manna, magnesia, rhubarb, senna, or aloes, or compounds of these, as Gregory's powder, the



compound rhubarb pill, compound colocynth pill, and the ordinary black draught, sufficient only being prescribed to insure the absence of an undue amount of excrementitial matter in the alimentary canal. If, however, the liver be in fault, other purgatives may be advantageously employed, and those should be selected which are known to possess an influence over the secretion of this organ. Small doses of a mercurial preparation, as calomel or blue pill, combined or not with colocynth, may be given at night, and followed in the morning by the ordinary black draught. In some patients the addition of a little of the acetic extract of colchicum to the colocynth pill will answer the purpose of the mercurial; in others the combination of the mercurial and colchicum is attended with beneficial results.

Saline purgatives are fitted for strong and plethoric habits, and the sulphate of magnesia, tartrate of potash, and similar salts, may now and then be given with advantage, combined or not with senna, rhubarb, or jalap and some aromatic; at the same time powerful hydragogue action should be avoided.

It is scarcely necessary to allude to the use of *Emetics* in the treatment of gout, as they are only called for in exceptional cases. If at the commencement of a fit the stomach be greatly loaded and oppressed, an emetic may afford relief, but no influence appears to be exerted on the progress of the attack. The use of these remedies in the treatment of gout

has been advocated by some physicians, and Dr. Small was accustomed to use them in his own case, employing tartar emetic combined with cinchona bark.

Mercurials.—The use of some preparation of mercury as a purgative has been already mentioned as occasionally of advantage in the treatment of acute gout, but I must here impress on the reader the great importance of caution in its administration, and more especially to those gouty subjects in whom there is reason to suspect an injured condition of the kidneys. In these cases mercurials, if given beyond the amount necessary to act as hepatic alterants, may be productive of most injurious consequences, and I have witnessed profuse salivation brought on by the administration of only two grains of calomel. Sir C. Scudamore, who used mercury rather freely as an alterative, and considered that, if employed with judgment and caution, it was a most valuable agent, appeared to be impressed with the fact that when given in repeated doses, it was liable to be followed by serious evil in gouty subjects, and in support of this opinion relates several illustrative cases. It can be shown that mercury does not exert any specific control over gouty inflammation, and hence, except with a view to its immediate purgative effect, it should not be administered. In advanced forms of gout its use should be altogether avoided.

Diuretics and Diaphoretics.—These remedies are

often of much service in acute gout when the urine is deficient in quantity, and the skin hot and dry. The action of the kidneys can usually be promoted by the use of such saline remedies as the acetate, citrate, tartrate, nitrate, or bicarbonate of potash in small doses, or by the phosphate of soda or sulphate of magnesia given in quantities insufficient to produce a purgative action. Most of these salts possess the power of altering the condition of the blood by rendering it more alkaline, and thus prove of considerable service in acute gout; on this point, however, we shall have occasion to dwell more fully when speaking of the treatment of the chronic affection. When it is desirable to induce diaphoresis, the acetate of ammonia may be given, taking care to aid its action by the free use of diluents. Occasionally it may be advisable to promote the action of the skin by the hot air or vapour bath, or by the use of tepid sponging with water or vinegar and water, but great caution must be used to avoid a chill to the surface.

Anodynes and Narcotics.—As an acute gouty fit is often accompanied with intense pain, the question of the propriety of giving direct anodynes is one of some importance. That opium often speedily relieves the pain of gout there cannot be a doubt, but is its action followed by injurious consequences? Cullen thus answers the question: "Opiates give the most certain relief from pain, yet when given in the beginning of gouty paroxysms, they cause them to return

with greater violence." Sydenham also was averse to their employment except under special circumstances. My own experience has led me to form a very similar opinion, and, unless the pain of gout be excessive, or there be fear that if not relieved the patient's nervous system will suffer, I always feel disposed to withhold their administration, and trust to other means, as opiates tend so powerfully to diminish the secretions and to augment congestion of the portal system.

When opium is really required, it may be given either in the solid form or in that of the tincture, or of any salt of morphia. It is then desirable to combine it with a sudorific and purgative, to avoid as much as possible its baneful influence upon the secreting organs. The compound powder of ipecacuanha is a useful form.

With regard to other anodynes, as henbane, belladonna, and so forth, circumstances may occasionally arise demanding their use, but these depend more upon the idiosyncrasies of the patients than the form of the disease. Henbane, for example, often produces a soothing effect in individuals in whom opiates cause nervous disturbance, and both henbane and belladonna possess the advantage of not diminishing the secretions. Aconite has been recommended by some, but its value in gout is by no means established.

Blood-Letting.—In the treatment of an attack of

acute gout the question of the value of blood-letting naturally arises, and although its discussion would have had more importance in former days, before the use of the lancet had fallen so much into disuse, it still affords enough interest to allow us to devote a few lines to its consideration.

Sydenham, although he thought bleeding by no means a remedy capable of curing gout, yet under certain limitations sanctioned its employment, as will be seen from the following passage: "Nevertheless, if the patient be young, and have drunk hard, blood may be drawn at the beginning of the fit. If, however, it be continued during the following fits, gout will take up its quarters even in a young subject, and its empire will be no government, but a tyranny." Cullen also, no advocate for much interference in gout, thinks some means may be taken with advantage to moderate the inflammation, especially in the young and vigorous, and in early paroxysms, and that bleeding may then be useful, but he is persuaded that it cannot be repeated with safety. From the qualified tone in which the opinions of these eminent men were announced, it is evident that although they occasionally allowed, they did not put much faith in this remedy, and although the advantages of general blood-letting were strongly insisted on by Drs. Hamilton, Rush, and Huxham, the profession, at the present day, seems to be tolerably unanimous in considering blood-letting a therapeutic means which should only be resorted to in exceptional cases.

Dr. Todd considers that blood-letting, by inducing asthenia, causes the inflammation to shift from place to place, but Dr. Gairdner states that in several cases of gout he has obtained much advantage from the use of small bleedings, as will be seen from the annexed quotations: "There are cases of plethora and atonic gout which, but for this remedy, would have baffled me, and yet were speedily and very thoroughly relieved by its aid;" and, "It is with me no matter of doubt, but of absolute certainty, that in instances of this kind, much suffering may be saved and no injury done, by the practice I have recommended;" but it is right to add another quotation in which he says, "It is necessary I should state that I never make use of this remedy in, and I consider it wholly inapplicable to, cases of gout in an impaired or defective constitution, even though there be evidence of plethora in the system. I believe that some considerable energy is necessary to its legitimate use, but this is generally met with in the early stages of gout."

Bleeding is certainly not curative of gouty inflammation, and, therefore, cannot be looked upon as a remedy having any specific power in its treatment. It can neither remove the impurity of the blood, nor the deposit which has taken place in the inflamed structures; the only advantage which can possibly be derived from its use, is the relief of plethora, which is usually present in the febrile attack; but this can generally be more safely effected by other and milder means. I have occasionally met with patients with

acute gout who have apparently experienced distinct relief from small venesections, but I have in no instance abstracted more than five or six ounces of blood, frequently less, and never sufficient to cause the slightest permanent debility. From my own experience I am convinced, that whenever blood-letting has been carried to an extent to cause subsequent depression,—and I have seen several cases where it has been so employed,—its effect has been to render the attacks more frequent and prolonged, without any advantage in the mitigation of the paroxysm.

The following rules as to the use of bleeding in gouty cases may be safely relied upon :—

Never bleed with the idea of directly subduing gouty inflammation.

Never bleed in advanced gout, or when the constitution is much weakened.

If bleeding be required in order to relieve general or local plethora,—and the former, at least, scarcely ever occurs in large cities,—abstract only so much as will effect that object, remembering that further depletion tends greatly to aggravate the disease and prolong its duration.

Local Treatment of Acute Gout.—Should we leave the inflamed joints to themselves, or should we have recourse to local treatment? It is of some practical importance to decide this question correctly, for the patient, naturally anxious for a speedy relief to his sufferings, is prone to think that remedies applied

immediately to the painful part, are likely to effect the desired object; the physician, on the other hand, may regard constitutional treatment as most efficacious, and look upon local applications as not altogether unattended with danger. It will, therefore, be desirable to pass in review some of the principal local remedies which have been proposed to alleviate gouty inflammation, and endeavour to ascertain their real value.

Leeches.—Our knowledge of the pathology of common inflammation and of the marked benefit derived from local depletion, would lead us to suppose that the condition of a joint in acute gout would be immediately relieved by leeches, and hence it is not very unusual to find that recourse is had to them under such circumstances. Experience does not sanction their employment, as their application has been sometimes followed by a transference of the inflammation either to some other joint, or to an internal organ, and sometimes by the occurrence of a diffuse form of inflammation. It has been also thought by some physicians, that although leeches may occasionally give temporary ease, the recovery is thereby prolonged, and permanent weakness of the joint induced.

If we direct our attention beyond the mere appearance of the joint, and reflect upon the intimate nature of gout, and moreover, if we view the inflammation merely as the local manifestation of a morbid condition of the whole system, we shall at once find an explanation of the comparative inefficiency of local depletion.

My own opinion of the inutility of local depletion in acute gout has been so decided, that I have never ordered leeches to an inflamed gouty joint, considering that they are never likely to prove efficacious, and that their use may be attended with injurious consequences; from what I have witnessed of the results of their application in cases for the treatment of which I have been subsequently consulted, I do not feel disposed to alter my view of their inutility.

Blisters.—The use of the blister as a local remedy in gout is by no means of modern introduction; about a century ago, a woman at Horsham was accustomed to sell a plaister which gained much reputation, and which, after the purchase of the secret, was discovered to consist simply of the ordinary blistering cerate. In 1770, Dr. Cartwright tried blisters with complete relief to pain; and Sir B. Shelley is said to have used them for nearly sixty years, when suffering from attacks of this disorder. Within the last few years, Dr. Todd advocated the same local treatment of gouty inflammation.

From having employed small blisters in many cases of gout, I have formed the following conclusions as to their value, and the circumstances under which they are needed.

Blisters are unnecessary in the early fits of asthenic gout, when the joints are not appreciably injured by prior attacks.

They are contra-indicated in advanced gout, when

the excreting power of the kidneys has become impaired; and especially in cases of extreme gouty deposits, as sores may be produced which are difficult to heal.

Blisters are of most advantage in cases of gout of an asthenic character, when the inflammation has a tendency to linger in the articulations and cause effusion.

A rational explanation may be given of the value of blisters in chronic and asthenic forms of gouty inflammation, as they give a stimulus to the local circulation, and the morbid action is directed from the tissues within the joint to the surrounding skin; besides which they cause a certain amount of serous exudation, rich in matters which give rise to the impurity of the blood.

The *moxa* has now and then been advised in gout, and was used by Sir William Temple with considerable relief.

Numerous other applications have at various times been suggested by different practitioners, and some of them are deserving of attention.

The application of *warmth* to the inflamed joints has been commonly advised, and this has been effected by enveloping them in new flannel or carded cotton surrounded by a light covering of oiled silk; hot fomentations and poultices have also been employed. Some practitioners have objected to the application of warmth in any form, under the idea of its causing too much relaxation and subsequent weakness, but it is

very questionable if the objection to the use of carded cotton is valid.

Sir C. Scudamore strongly advocated the use of tepid evaporating lotions to the inflamed joints, and advised a mixture of one part of rectified spirit and two parts of camphor mixture. He states in his works that he had used this lotion lukewarm, and applied by means of linen rags, and had found it very successful; he recommends a temperature of 75° to 85° Fahr. The linen compress should consist of six or eight folds laid one upon another, and kept constantly wet; and in the night, when this precaution cannot be always employed, a layer of oiled silk should be used to prevent the rapid evaporation and drying of the cloth. Sir C. Scudamore remarks that even the very free use of this lotion has no tendency to produce retrocession of the disease.

Having had but little experience in this method of treatment I can offer no opinion as to its efficacy, but am inclined to consider that all applications are uncalled-for in the majority of gouty cases.

Now and then when the pain is very intense, relief is given by *anodynes*, and preparations of opium, belladonna and aconite have been used for the purpose. Those of belladonna are perhaps of most service, and an elegant method of applying the drug is in the form of a solution of atropine, made by dissolving from two to three grains of the alkaloid in a weak mixture of spirit and water, and applying it to the inflamed joint by means of compresses of lint,

or a few folds of linen, preventing evaporation by a covering of oiled silk.

Occasionally physicians, from regarding gout as a local affection only, have had recourse to the application of *cold;* and sometimes patients, with an idea of obtaining rapid relief from their sufferings, have immersed the inflamed limb in cold water, or even applied snow directly to the part.

Such plans of treatment are fraught with the greatest danger, and cannot possibly be advocated on a rational view of the nature of the disease, as they are apt to cause retrocession of the articular inflammation, and the sudden and serious affection of some internal organ; at no time do they more than temporarily assuage the pain, and never exert any lasting influence over the severity or duration of the paroxysm.

The management required in an ordinary attack of acute gout may be thus shortly summed up:

The diet should be very light and chiefly amylaceous, diluents freely used, but no alcoholic stimulants allowed, unless in exceptional cases.

The medicinal treatment should consist in the administration of some simple alkaline saline, combined with a moderate dose of colchicum. If necessary, purgatives may be given, selected according to the habit and condition of the patient. In the majority of cases, this will be found to be all that is necessary, but in some instances certain modifications may be essential; for example, if there be plethora, the ques-

tion of the abstraction of a few ounces of blood may possibly arise: on the other hand, if the vital powers are at a low ebb, and great vascular and nervous depression exists, it may be desirable to give ammonia in addition to other salines; at the same time the colchicum should be either omitted, or used with the greatest caution.

The only local application required in the majority of cases is cotton wool, covered lightly with oiled silk, but now and then an anodyne may be advantageously used, and a small blister is occasionally of service.

CHAPTER XI.

TREATMENT OF GOUT.—COLCHICUM—IMPORTANCE OF THE STUDY OF ITS MODE OF OPERATION—THE HERMODACTYLUS OF THE ANCIENTS PROBABLY A SPECIES OF COLCHICUM—CHEMICAL COMPOSITION OF COLCHICUM—ITS PHYSIOLOGICAL ACTION—CURATIVE EFFECTS NOT EXPLAINABLE BY ITS PURGATIVE PROPERTY—ITS INFLUENCE ON THE CIRCULATING SYSTEM—ON THE URINE—DR. CHRISTISON'S EXPERIMENTS—OBSERVATIONS OF PROFESSOR CHELIUS—AUTHOR'S ANALYSES EXHIBITING THE EFFECT OF COLCHICUM ON THE URINE—DEDUCTIONS THEREFROM—MODE OF EMPLOYING COLCHICUM IN THE TREATMENT OF GOUT—THE QUESTION DISCUSSED AS TO ITS LIABILITY TO CAUSE MISCHIEF—DIFFERENT PREPARATIONS OF COLCHICUM—WHITE HELLEBORE IN GOUT—OBSERVATIONS ON ITS ACTION.

As Colchicum is a drug extensively employed in the treatment of gout, and though condemned by some, regarded by others as worthy of being called a specific for the disease, it will not be out of place to devote a short Chapter to its consideration, and endeavour to ascertain its real nature, and the manner in which its influence upon the system, for good or evil, is exerted.

Among the later Greek and Arabian physicians, a medicine called hermodactyl (ἑρμοδάκτυλος, from Ἑρμῆς Hermes or Mercury, and δάκτυλος a finger) was in great repute as a remedy for arthritic diseases, being first mentioned by Alexander of Trales, about

the year A.D. 580. Paulus Ægineta, Avicenna, Serapion and Mesue, likewise allude to it.

Under the name of Surugen or hermodactyl, Serapion comprehends the κολχικόν and ἐφήμερον of Dioscorides, and the ἑρμοδάκτυλος of Paulus, and by some of the older writers the hermodactyl was called anima articulorum, or the soul of the joints. Dr. Pereira considered that the corms brought, in modern times, from Oriental countries under the name of hermodactyls, answer to the description given to the ancient substance bearing the same name, and he was therefore induced to believe that they were identical, or at least the underground stems of some species of colchicum, but not those of colchicum autumnale. The hermodactyls have not been submitted to the test of physiological experiment in this country, though from the description of those employed in the treatment of joint affections by Paulus Ægineta, it seems that in this respect they resembled our ordinary colchicum, for he says, "Some, in the paroxysms of all arthritic disease, have recourse to purging with hermodactylus; but it is to be remarked that the hermodactylus is bad for the stomach, producing nausea and anorexia, and ought therefore to be used only in the case of those who are pressed by urgent business, for it removes rheumatism quickly and after two days at most, so that they are enabled to resume their accustomed employment."

The Colchicum Autumnale, or Meadow Saffron, has only been employed within the last century, having

been introduced as a medicine by Baron Störk, in 1763; it is probably the active ingredient of the celebrated Eau Médicinale, which was once employed about this time by M. Husson, a military officer in the service of the King of France.

Colchicum Autumnale belongs to the natural order Melanthaceæ, in which it is associated with several other plants possessing powerful effects on the animal economy, as, for example, the Veratrum album or white hellebore, the Veratrum viride, and the Assagræa officinalis or cevadilla. The corms and seeds are the parts mostly employed in medicine, but the flowers have been occasionally used; when chemically examined, all parts of the plant are found to possess a bitter and somewhat acrid taste, evidently depending on the presence of a peculiar principle.

At first, on the authority of Pelletier and Caventou, the bitter and active matter of colchicum was supposed to be the same as that which exists in the veratrum album and cevadilla; this, however, is erroneous. Geiger and Hesse subsequently asserted that they had obtained an alkaloid from the colchicum plant, which they named Colchicia, differing from veratrine in many properties, being crystalline, soluble in water, alcohol, and ether, bitter in taste, but devoid of the irritating or sternutatory effects possessed by veratrine, and giving with nitric acid a beautiful violet colour, quickly changing first to indigo, then to green and yellow. Many chemists have endeavoured to obtain crystallised colchicia, since the announcement

of Geiger and Hesse, but I believe without success. In 1856, M. Oberlin re-examined the subject, and the following are the results of his investigation: He was quite unable to obtain the alkaloid described by Geiger and Hesse, but separated another substance, which he has named Colchiceine; this principle is almost insoluble in water, but soluble in alcohol, ether, and chloroform, it is neutral in re-action, and gives with nitric acid a beautiful violet colour.

The physiological effects ascribed to colchicum are those of a powerful local irritant and nervous sedative; on the lower animals, such as the dog, it causes, when injected into the veins, loss of all voluntary power, extreme slowness of breathing, and considerable diminution in the rapidity and force of the pulse; vomiting and bilious purging are also produced; the pulse afterwards becomes rapid and irregular, the breathing hurried, and death ensues. After death the mucous membrane of the stomach and duodenum, and other parts of the intestinal canal, are found congested and inflamed. Cases of poisoning in the human subject from colchicum are on record, and the effects most uniformly observed are vomiting, purging, and tenesmus; slow, weak and often intermitting pulse; coldness of the extremities, and great prostration of strength: convulsions and coma are seldom produced. When administered in therapeutic doses, colchicum is considered to possess a considerable power over the secreting and excreting functions, and especially over those of the intestinal mucous membrane. If the dose

be large, and frequently repeated, it purges, and not uncommonly produces nausea and vomiting; its influence upon the liver is readily recognised by the appearance of the fæces and vomited matters; colchicum is generally regarded as possessing a diuretic action, and likewise considered to alter the composition of the urine, increasing the amount of the solid portion, and more especially of uric acid and urea; we shall presently endeavour to show from the results of our own investigations, if these latter suppositions be correct.

That colchicum in its various forms has a most powerful influence upon the progress of gouty inflammation is undeniable, and this action is not simply limited to the removal of gout when it attacks the joints, but it proves efficacious even in its masked and irregular forms. Sir Henry Holland states that from experience he can assert that the influence of colchicum is striking and well defined in the chronic forms of the constitutional disorder, in the peculiar ophthalmia of gouty habits, in gouty bronchitis, and also in a class of headaches connected with this diathesis. My own experience fully coincides with that of Sir H. Holland, and I would even go the length of asserting that we may sometimes diagnose gouty from any other form of inflammation, by noting the influence of colchicum upon its progress.

Many physicians consider that it is necessary that colchicum should purge, in order that relief may be obtained from its use; but the opinion of those who have had most experience of the remedy militates

against this view, as do likewise my own observations, which prove in addition, that brisk purging produced by other means is not productive of the same beneficial effect. I have found speedy relief afforded by the use of colchicum, to persons suffering from the most excruciating pain, without the occurrence of any appreciable discharge. One patient whose attacks were very severe, and who had been accustomed for a long time to take the drug without medical advice, stated that in two or three hours after taking a two-drachm dose of colchicum wine, he felt himself in paradise, yet no action of the bowels had been produced. In another instance when I ordered a drachm and a-half of the same preparation, without the addition of any other medicine, most rapid alleviation of pain was experienced, yet unattended with purging or sensible evacuation; and within the last few months I have seen four gouty patients experience similar relief from like doses: in one case only was purging induced, and then not until some hours after the pain had subsided.

To show the inefficiency of simple purging in controlling gouty inflammation, I may mention the case of a man about 32 years of age, who, at the time of admission into the hospital, was suffering from his seventh attack of gout, and had numerous joints affected, with a quick, full, and hard pulse, a furred tongue, great thirst, and hot and dry skin. A draught containing two drachms of sulphate of magnesia and a scruple of the carbonate suspended in an ounce of cinnamon water was administered three times a day,

Dr. Maclagan found that 20 minims of colchicum tincture produced on two occasions the following effect on his own pulse:—

FIRST OBSERVATION.		SECOND OBSERVATION.	
At 8, P.M.,	Pulse 87	At 6, P.M.,	Pulse 84
,, 9, ,,	,, 87	,, 7, ,,	,, 84
,, 10, ,,	,, 80	,, 8, ,,	,, 78
,, 11, ,,	,, 75	,, 9, ,,	,, 72
,, 11½, ,,	,, 70	,, 10, ,,	,, 66
,, 12, ,,	,, 65	,, 11, ,,	,, 60
,, 12½, A.M.,	,, 65	,, 12, ,,	,, 62

No other physiological action was manifested, except slight nausea.

If the sole action of colchicum depends on its sedative property, we should expect to find this drug equally efficacious in other inflammatory affections; now, although it possesses some controlling power over inflammation which is not gouty in character, this is by no means well marked, and is not at all equal to that produced by other medicines, as tartar emetic and calomel; furthermore these latter remedies, so powerful in other diseases, exert no very decided influence over gouty inflammation.

If the action of colchicum cannot be explained either by its purgative action or its sedative influence on the vascular system, we are naturally led to seek if its effect on the kidneys and the urinary secretion will afford any clue to its modus operandi. Hence the questions arise: Does colchicum act as a diuretic? Does it cause the elimination of uric acid from the blood, or its destruction when already formed? or,

lastly, Is its influence solely exerted upon the tissues in which the deposited urate of soda has given rise to inflammatory action?

Dr. Christison found that, after giving colchicum to a patient for two days, the quantity of urea was nearly doubled; before taking the drug the urine had a specific gravity of 1020, contained two per cent. of urea, and was free from any deposit of urates; but, during the first and second days after commencing the medicine, the urine was of the densities 1033·5 and 1034, was turbid from urate of ammonia, and the second specimen yielded at least 3·5 per cent. of urea. At first sight this experiment would appear to show a marked influence of colchicum in increasing the elimination both of urea and uric acid, but on further investigation a source of error will be discovered. Dr. Christison took specimens of urine for analysis, without reference to the quantity passed in the twenty-four hours, so that, although after the administration of the colchicum, a given sample was richer in urea and uric acid, no proof was afforded that the total daily elimination of the principles was augmented; on the contrary, they might have been decreased, for a notable diminution in the quantity of the urinary secretion often occurs from the purgative action of the colchicum.

Dr. J. McGrigor Maclagan, who made similar experiments, arrived at like results, the analyses being made on specimens of urine passed at particular times of the day, but there was no attempt to show the daily average of these principles.

As closely connected with the subject I may mention that Professor Chelius, of Heidelburg, made some experiments, the results of which are apparently in favour of the idea that colchicum gives relief by increasing the secretion of uric acid by the kidneys. He found in one case that the quantity of uric acid was nearly doubled on the space of twelve days, but it must be remembered that the observations were made on a gouty subject, and one recovering from a recent attack of the disease, circumstances which alone would be sufficient to vitiate the experiments; for during convalescence the same phenomenon may occur without the administration of any medicine.

In opposition to these statements it should be remarked that Dr. Graves regards the power of colchicum as due to its lessening the formation of uric acid in the system, and not to its increasing its elimination by the urine.

I have made the following observations with the view of ascertaining the action of colchicum upon the urinary secretion.

The first patient, a man, W. L., aged 30, suffering only from a slight chronic eczematous eruption; at the time the examinations were made, he was placed upon a regulated diet, and the urine carefully collected.

Before taking colchicum:—

Oct. 30.	Urine,	56 fl. ozs.;	sp. gr.	1016.	Uric acid in 24 hrs.	= 8·73	grs.
,, 31.	,,	64 ,,	,,	1014.	,, ,,	= 7·9	,,
Nov. 1.	,,	84 ,,	,,	1012.	,, ,,	= 8·09	,,

Nov. 3. Urine 66 fl. ozs.; sp. gr. 1016. Uric acid in 24 hrs. = 8·18 grs.

Average: Urine, 68·5 fl. ozs. Uric acid = 8·24 grs.

When taking colchicum :—

Nov. 4.	Urine,	56 fl. ozs.;	sp. gr.	1015.	Uric acid in 24 hrs.	=	6·05	grs.
,, 5.	,,	56 ,,	,,	1016.	,, ,,	=	8·51	,,
,, 6.	,,	46 ,,	,,	1020.	,, ,,	=	8·00	,,
,, 7.	,,	56 ,,	,,	1016.	,, ,,	=	6·61	,,
,, 9.	,,	54 ,,	,,	1021.	,, ,,	=	9·18	,,

Average: Urine, 55·6 fl. ozs. Uric acid = 7·67 grs.

The next patient was a young man, C. W., aged 19, suffering from a chronic affection of the upper lip (elephantiasis); general health pretty good. During the time the analyses were made, the diet was uniform, and every precaution taken to secure accuracy in the results.

Before taking colchicum :—

Jan. 13. 1854.	Urine,	55 fl. ozs.;	sp. gr.	1017.	Uric acid in 24 hrs.	=	7·91	grs.
,, 14.	,,	,, 28 ,,	,,	1027.	,,	=	4·48	,,
,, 15.	,,	,, 30 ,,	,,	1027.	,,	=	3·00	,,

Average: Urine, 37·7 fl. ozs. Uric acid = 5·03 grs.

When taking colchicum (half a fluid drachm three times a day).

Jan. 16. 1854.	Urine,	47 fl. ozs.;	sp. gr.	1015.	Uric acid in 24 hrs.	=	1·34	grs.
,, 18.	,,	,, 23 ,,	,,	1024.	,,	=	7·55	,,
,, 19.	,,	,, 24 ,,	,,	1025.	,,	=	7·24	,,
,, 20.	,,	,, 13 ,,	,,	1031.	,,	=	5·00	,,
,, 22.	,,	,, 19 ,,	,,	1027.	,,	=	5·34	,,

Average: Urine, 25·2 fl. ozs. Uric acid, 5·29 grs.

The colchicum was taken three times a day for two days; on the occurrence of purging, one dose was omitted; the two doses each day were sufficient to keep up a free action of the bowels.

The third case, a gouty man, B. F., who during five days, when not taking any medicine, passed the following amounts of uric acid: 1·30 grains, 1·95 grains, 2·73 grains, 2·14 grains, and 3·05 grains. Colchicum wine was afterwards administered in half drachm doses three times a day, combined with calcined magnesia, and was almost immediately followed by a marked improvement in the affected joints.

Under colchicum :—

Jan. 20. 1853. Urine, 43 fl. ounces; sp. gr. 1011. Acid. Uric acid in the 24 hours=2·58 grains.
,, 21. ,, Diarrhœa from medicine caused the loss of much urine.
,, 22. ,, Urine, 35 fl. ounces; sp. gr. 1012. Acid. Uric acid in the 24 hours=3·32 grains.
,, 23. ,, Urine, 47 fl. ounces; sp. gr. 1011. Acid. Uric acid in the 24 hours=3·99 grains.
On the 21st, the patient took but two doses of the medicine.
On the 22nd, but one, and discontinued it.
Jan. 26. 1853. Urine, 74 fl. ounces; sp. gr. 1011. Acid. Uric acid in the 24 hours=4·07 grains.
,, 27. ,, Urine, 56 fl. ounces; sp. gr. 1011. Acid. Uric acid in the 24 hours=3·08 grains.

Before taking colchicum :—

Average amount of uric acid passed in the 24 hours=2·23 grs.

When taking colchicum :—

Average amount of uric acid passed in 24 hours, 3·41 grains.

C. F., a male patient, on half extra full diet, not suffering from any very active symptoms, but having a large abscess discharging urate of soda and pus.

Under the influence of colchicum :—

Jan. 4.	Urine,	57 fl. ozs.;	sp. gr.	1012.	Uric acid in 24 hrs.		=	0·58 grs.
,, 5.	,,	44 ,,	,,	1013.	,,	,,	=	0·06 ,,
,, 6.	,,	44 ,,	,,	1013.	,,	,,	=	0·00 ,,
,, 7.	,,	37 ,,	,,	1012.	,,	,,	=	0·14 ,,
,, 8.	,,	48 ,,	,,	1011.	,,	,,	=	0·00 ,,
,, 9.	,,	44 ,,	,,	1011.	,,	,,	=	0·00 ,,

The diet the same, but without colchicum :—

Jan. 10.	Urine,	44 fl. ozs.;	sp. gr.	1012.	Uric acid in 24 hrs.		=	0·72 grs.
,, 11.	,,	34 ,,	,,	1014.	,,	,,	=	0·85 ,,
,, 12.	,,	61 ,,	,,	1013.	,,	,,	=	2·44 ,,
,, 13.	,,	55 ,,	,,	1012.	,,	,,	=	0·00 ,,
,, 14.	,,	87 ,,	,,	1009.	,,	,,	=	0·00 ,,

The averages being—

Under colchicum.	Urine,	45·6 fl. ozs.;	uric acid	= 0·13 grs.
Without medicine.	,,	56·2 ,,	,,	= 0·80 ,,

J. L., a male, aged 57, has had several attacks of gout; a year or more generally elapses between each; for the first few years the ball of the great toe only was affected, but the disease afterwards travelled upwards. No deposits of urate of soda visible. During the time that the joints were severely affected the urine was scanty and high coloured, giving rise to a red sediment of urates. At the time the quantitative analyses were commenced the patient was suffering from slight affection of the joints not accompanied with febrile disturbance.

When not taking medicine :—

Feb. 7. Urine, 26·5 fl. ounces ; sp. gr. 1021, at 60° Fah. Clear.
Urea passed in the 24 hours = 213 grains.
,, 8. Urine, 28 fl. ounces; sp. gr. 1020·5, at 60° Fah.
Urea passed in the 24 hours = 199 grains.
Uric acid, a few crystals, too small to collect and weigh.
,, 9. Urine, 37 fl. ounces; sp. gr. 2019, at 60° Fah.
Urea passed in the 24 hours = 259 grains.
Uric acid, only a few microscopic crystals.

Under the influence of colchicum :—

Feb. 10. Urine, 38 fl. ounces; sp. gr. 1019, at 60° Fah.
Urea passed in the 24 hours = 209 grains.
Uric acid, a quantity too minute to collect.
,, 11. Urine, 32 fl. ounces; sp. gr. 1021, at 60° Fah.
Urea in the 34 hours = 244 grains.
Uric acid in microscopic quantities only.
,, 12. Urine, 41 fl. ounces; sp. gr. 1019, at 60° Fah.
Urea passed in the 24 hours = 270.
Uric acid, a trace only.
,, 13. Urine, 39 fl. ounces; sp. gr. 1017·5 at 60° Fah.
Urea passed in the 24 hours = 241 grains.
Uric acid, a very few crystals, too small to collect.
,, 14. Urine, 33 fl. ounces; sp. gr. 1021·5, at 60° Fah.
Urea passed in the 24 hours = 259 grains.
Uric acid, a trace.

The patient omitted colchicum at the last date, as some feeling of faintness was induced by its use.

Feb. 16. Urine, 30 fl. ounces; sp. gr. 1020, at 60° Fah.
Urea passed in the 24 hours = 201 grains.
,, 19. Urine, 30 fl. ounces; sp. gr. 1020, at 60° Fah.
Urea passed in the 24 hours = 201 grains.
,, 20. Urine, 42 fl. ounces; sp. gr. 1017·5, at 60° Fah.
Urea passed in the 24 hours = 251 grains.
,, 21. Urine, 51 fl. ounces; sp. gr. 1014·5, at 60° Fah.
Urea passed in the 24 hours = 279 grains.
No crystals of uric acid precipitated by the addition of hydrochloric acid.

Feb. 22. Urine, 54 fl. ounces; sp. gr. 1013·5, at 60° Fah.
Urea passed in the 24 hours = 250 grains.

Average before taking medicine :—

Quantity of urine passed in the 24 hours = 30·5 fl. ounces.
Amount of urea ,, ,, = 223·6 grains.

Average during the administration of colchicum :—

Quantity of urine passed in the 24 hours = 36·6 fl. ounces.
Amount of urea ,, ,, = 244 grains.

Average after omitting the use of the colchicum :—

Quantity of urine passed in the 24 hours = 41·4 fl. ounces.
Amount of urea ,, ,, = 236·4 grains.

The amount of uric acid was in no instance sufficient to collect and weigh.

H. C., a male, aged 51. Had suffered from many attacks of gout, but was not labouring under any acute affection at the time the urine was examined.

Urine before the administration of colchicum :—

Nov. 25.	Urine,	98 fl. ozs.;	sp. gr.	1008.	Uric acid in the 24 hrs.	=	1·96 grs.
,, 26.	,,	72	,,	1012.	,,	=	3·12 ,,
,, 27.	,,	68	,,	1014.	,,	=	2·72 ,,
,, 28.	,,	60	,,	1014.	,,	=	3·00 ,,

Under colchicum (twenty minims of the wine three times a day) :—

Nov. 20.	Urine,	68 fl. ozs.;	sp. gr.	1011.	Uric acid in the 24 hrs.	=	1·81 grs.
,, 30.	,,	66	,,	1012.	,,	=	2·20 ,,
Dec. 1.	,,	64	,,	1012.	,,	=	2·13 ,,
,, 2.	,,	72	,,	1008.	,,	=	1·56 ,,

Average before taking medicine :—

Quantity, 74·5 fl. ozs.; uric acid passed in the 24 hours = 2·70 grains.

Average when taking colchicum :—

Quantity, 67·5 fl. ozs., uric acid passed in the 24 hours = 1·88 grs.

The subjoined analyses, 71 in number, were made on the urine of a male patient, H. C., 51 years of age, who was admitted into the hospital in November, 1852, suffering from chronic bronchitis, accompanied with much difficulty of breathing: in a short time the symptoms were relieved in a very striking manner on the occurrence of a severe attack of gout in the ball of the great toe, which afterwards extended to the side of the foot and knee. About five weeks after, on readmission for another attack of bronchitis, the examinations of the urine were commenced, the patient at the time having flying gouty pains in many joints. The results, including the amount of urine passed each day, its specific gravity, and the daily elimination of uric acid, illustrate well the disposition which the kidneys appear to acquire in gout of throwing out the acid in an irregular and intermittent manner. In the present case the daily amount of this principle was sometimes as much as eight grains, sometimes as little as two-tenths of a grain. As colchicum was administered during a part of the time, any influence it might have in altering the amount of uric acid would be shown, and it appears from these results, that it diminished rather than increased its excretion, thus confirming the conclusion at which we had previously arrived. The average of the uric acid during the whole time the patient was

under the drug being 1·65 grain, whereas when not taking colchicum it was 2·26 grains.

Date.	Quantity and sp. gravity of the urine.		Uric acid passed in the 24 hours.		Circumstances and state of patients.
1852.					
Nov. 25	98 fl. ozs.	1008	1·96 grs.		No medicine.
,, 26	72 ,,	1012	3·12 ,,		
,, 27	68 ,,	1014	2·72 ,,		Average of uric acid passed per diem = 2·70 grs.
,, 28	60 ,,	1013·5	3·00 ,,		
,, 29	68 ,,	1010	1·81 ,,		Vinum Colchici, M. xx. ter in die.
,, 30	66 ,,	1011·5	2·20 ,,		
Dec. 1	64 ,,	1011·5	2·13 ,,		
,, 2	72 ,,	1007	0·36 ,,		Average of uric acid passed per diem = 1·39 gr.
,, 3	66 ,,	1011	0·44 ,,		
,, 4	68 ,,	1010	1·13 ,,		
,, 5	64 ,,	1010	0·64 ,,		Vinum Colchici, M. xxx. ter in die.
,, 6	68 ,,	1010·5	1·70 ,,		
,, 7	76 ,,	1010	1·77 ,,		
,, 8	72 ,,	1011	0·48 ,,		
,, 9	70 ,,	1011	0·47 ,,		
,, 10	46 ,,	1012	1·38 ,,		
,, 11	50 ,,	1010·5	1·00 ,,		Average of uric acid passed per diem 1·27 gr.
,, 12	47 ,,	1012·5	2·82 ,,		
,, 13	45 ,,	1012	1·65 ,,		
,, 14	37 ,,	1014	1·85 ,,		
,, 15	51 ,,	1009·5	1·02 ,,		
,, 16	45 ,,	1010	0·90 ,,		
,, 17	37 ,,	1011·5	1·35 ,,		
,, 18	54 ,,	1007	0·27 ,,		
,, 19	46 ,,	1010	0·15 ,,		
,, 20	57 ,,	1009	0·19 ,,		
,, 21	51 ,,	1015	2·21 ,,		No medicine.
,, 22	66 ,,	1012	1·81 ,,		
,, 23	49 ,,	1010	0·65 ,,		
,, 24	35 ,,	1013	1·75 ,,		
,, 25	49 ,,	1011·5	2·61 ,,		
,, 26	64 ,,	1008	0·21 ,,		
,, 27	48 ,,	1010	0·64 ,,		
,, 28	61 ,,	1012	1·22 ,,		

Date.	Quantity and sp. gravity of the urine.	Uric acid passed in the 24 hours.	Circumstances and state of patients.
1852.			
Dec. 29	52 fl. ozs. 1013	0·69 grs.	
,, 30	49 ,, 1015·5	0·41 ,,	
,, 31	49 ,, 1012	0·49 ,,	
1853.			
Jan. 1	53 ,, 1015	0·18 ,,	
,, 2	66 ,, 1013·5	4·07 ,,	
,, 3	70 ,, 1011·5	4·08 ,,	
,, 4	51 ,, 1012	3·65 ,,	
,, 5	50 ,, 1011	2·92 ,,	
,, 6	64 ,, 1010	1·28 ,,	
,, 7	48 ,, 1011·5	2·00 ,,	No medicine.
,, 8	56 ,, 1011	3·17 ,,	
,, 9	55 ,, 1011·5	2·84 ,,	
,, 10	55 ,, 1009	0·18 ,,	
,, 11	11 ,, 1030	3·10 ,,	
,, 12	36 ,, 1015·5	3·60 ,,	
,, 13	28 ,, 1018	2·60 ,,	
,, 14	47 ,, 1013·5	2·04 ,,	
,, 15	53 ,, 1011·5	3·53 ,,	
,, 16	43 ,, 1011·5	3·30 ,,	
,, 17	35 ,, 1014·5	5·60 ,,	
,, 18	23 ,, 1019·5	6·20 ,,	Vinum Colchici, ℥ss. ter in die.
,, 19	24 ,, 1022	8·60 ,,	
,, 20	21 ,, 1022	5·70 ,,	
,, 21	50 ,, 1012	5·00 ,,	
,, 22	37 ,, 1008	1·23 ,,	
,, 23	56 ,, 1007·5	1·49 ,,	Average of uric acid passed per diem = 30·02 grs.
,, 24	45 ,, 1011	3·45 ,,	
,, 25	52 ,, 1006·5	0·52 ,,	
,, 26	30 ,, 1016	2·00 ,,	
,, 27	59 ,, 1010·5	1·96 ,,	
,, 28	57 ,, 1314·5	4·37 ,,	
,, 29	50 ,, 1011	1·17 ,,	
,, 30	58 ,, 1012	0·97 ,,	No medicine.
,, 31	85 ,, 1907	not determined.	
Feb. 1	45 ,, 1012	0·75 grs.	
,, 2	67 ,, 1012	2·46 ,,	
,, 3	46 ,, 1012	1·69 ,,	

Uric acid passed in 24 hours:—

Maximum of uric acid	8·60 grs.
Minimum	0·18 ,,
Average	1·96 ,,
Average without colchicum	2·26 ,,
Average under colchicum	1·65 ,,

Quantity and specific gravity of urine:—

Average quantity of urine passed without colchicum	51 fl. ozs.
Specific gravity	1012·5 ,,
Average quantity under colchicum	51 ,,
Specific gravity	1011·4 ,,

Results of analyses.—The results of these observations on the action of colchicum may be thus summed up. In Case 1, where neither gouty affection nor febrile disturbance existed, colchicum appeared to have the effect of slightly diminishing the quantity of urine and likewise of decreasing the excretion of uric acid.

In Case 2, where the circumstances were similar, the influence of the medicine appeared to be a notable diminution of the quantity of urine, the amount of uric acid being a little augmented. This increase, however, was less than a quarter of a grain, and might arise, at least in part, from the circumstance that uric acid is to some extent soluble in water, and therefore, when the urinary excretion is large, a portion may escape precipitation.

In Case 3, a gouty man recovering from an acute attack, the amount of uric acid was somewhat increased, but not more than frequently occurs in

patients under like circumstances, where no medicine is administered.

In Case 4, the colchicum appeared to cause a decrease both of the urine and uric acid.

In Case 5, when the examinations were made both before and after the administration of the colchicum, as also during the time the patient was taking the drug, the amount of uric acid appeared to remain about the same, but was extremely small throughout. The urea was slightly augmented during the action of the medicine. The quantity of the urine was also larger, but little stress can be laid upon the fact, as it continued to increase still more after the drug was discontinued.

In Case 6, the excretion of uric acid became much less, and the quantity of urine also smaller; but in this patient's urine considerable variations were observed, many of them totally irrespective of the action of remedies, a circumstance which renders the figures less valuable.

In Case 8, we find that the amount of urine was the same when the patient was taking colchicum as when no drug was given; but the quantity of uric acid was notably diminished during its administration.

Besides the results we have just detailed, we have, in the chapter on the urine, given several other analyses, showing the influence of colchicum upon the urinary secretions. Thus, among the cases of acute gout, we find the patient (Case 4) was under the marked influence of colchicum on the 19th and 20th

of February, and the peculiarity of the urine consisted in its containing a very small amount of uric acid, compared with that present during the time the inflammation was severe. In Case 5, colchicum was given during the whole course of the attack, but as the dose was rather small, and the man had been long accustomed to its administration, the daily alteration of the uric acid probably depended rather upon the different phases of the disease than the influence of the drug. Among the patients suffering from chronic gout it will be seen that in Case 11 colchicum was administered with the apparent effect of diminishing the excretion both of uric acid and urea.

From a general review of the results obtained in the preceding analyses, we are compelled to draw the following conclusions.

First. There is no evidence that colchicum produces any of its effects upon the system by causing the kidneys to eliminate an increased quantity of uric acid; in fact, when the drug is continued for any lengthened time, it appears to exert a contrary effect.

Secondly. We cannot assert that colchicum has any influence upon the excretion of urea, or the other solid ingredients of the urine.

Thirdly. Colchicum does not act as a diuretic in all cases; on the contrary, it often diminishes the quantity of urine, more especially when it produces a marked effect upon the alimentary canal.

Dr. Christison's observations would probably have agreed with many of my own, had I taken for analysis

portions only of the daily urine, for Case 2 might have been made to show that the uric acid was more than doubled by the remedy, although in reality there was no increase in the daily elimination. I am therefore inclined to think, that the statements relative to the increase of uric acid from the exhibition of colchicum have arisen either from the disease having become altered in phase during the examinations, or that erroneous deductions have been drawn from the analyses having been confined to portions only of the daily urine.

As the operation of colchicum can neither be explained by its purgative effects, nor by its power of altering the character of the blood and urine, its real mode of action is still a subject for inquiry, and well worthy the attention of the therapeutist. Some have suggested that it may act on the nervous system as a sedative, but such an explanation is of so general a character that it applies to many drugs besides colchicum. Others have imagined that its power is due to the influence which it exerts on the peculiar structures implicated in gouty inflammation, namely the ligamentous and cartilaginous tissues; this may possibly be correct, for we know that certain sedatives control the heart, or central organ of the circulating system, others, the capillaries or extreme portions, and it may be that those tissues, of which the vitality is low, are peculiarly affected by the drug in question. Should this be the case, we should naturally expect to find inflammation of the same tissues, when not of a gouty

character, controllable by means of colchicum, and that gouty symptoms when not connected with such inflammation, are not so influenced; but before the subject can be considered definitely settled, much further clinical experience is needed; there are, it is true, many obstacles in the inquiry, and not the least of these is the difficulty of positively ascertaining if, in our comparative trials, the affected tissues are always the same.

Although colchicum may possess some power over rheumatic inflammation, it assuredly does not exert the specific action exhibited in cases of true gout, but it may be argued that the structures affected in the two diseases are not precisely the same.

It is asserted by some that colchicum possesses the power of rendering the urine neutral, or even alkaline: that such is not an invariable effect my own observations prove, but as the examinations were all made on the whole day's urine, which rapidly changes after its secretion, the amount of this influence was not ascertained.

Without attempting at present to explain how colchicum acts in controlling gouty inflammation, I shall content myself in asserting that it does so in a most marked degree; a fact placed beyond doubt by the evidence already adduced, and which could be strengthened, if necessary, by further proof, especially by the fact that sufferers from gout often take colchicum, not only without consulting their medical advisers, but even contrary to their injunctions.

The great popularity of the different quack preparations, such as the Eau Médicinale, Wilson's Tincture, and Reynolds' Specific, all of which owe their efficacy to the colchicum they contain, point to the same conclusion; and I believe we may safely assert, that colchicum possesses as specific a control over true gouty inflammation as cinchona barks over intermittent fever. The evidence hitherto adduced of the power of colchicum in alleviating the urgent symptoms of gout, has not in any way proved that it may not be injurious in its after-effects, and the determination of this point is fraught with interest. Sir C. Scudamore, in alluding to the Eau Médicinale, of which he had often witnessed the effects, remarked that it had been the fruitful source of many cases of chronic gout, by enfeebling the nervous system, and occasioning a degree of despondency and languor never before experienced; he furthermore asserted, that he had found no cases of gout so tedious and intractable as those which had been thus empirically treated.

Notwithstanding these remarks with regard to the Eau Médicinale, Sir C. Scudamore was in the constant habit of prescribing colchicum, and has stated in some of his writings, that it must be admitted to be a valuable medicine by all who had sufficient opportunity of putting its merits to the test.

Other physicians have also expressed themselves strongly on the subject of the injurious effects of colchicum; for example, Dr. Petit had an idea that it caused gouty attacks to become more frequent and chronic, and

Dr. Todd in his clinical lectures expresses a similar opinion, for he remarks, that although colchicum shortens the duration of the fits, it also diminishes the interval between the attacks, and that the system gets accustomed to its use as it does to opium, and therefore the dose must be increased in order to keep up the effect. It is curious to find that Paulus Ægineta, in reference to the use of hermodactylus in gout, says, that although it generally removes the symptoms within two days, it injures the stomach and produces loss of appetite, and should therefore be used only by those who are engaged in urgent business.

In antagonism to these authorities, there are many physicians of the highest eminence who regard colchicum as a remedy of the utmost value in the treatment of the varied manifestations of gout; among these I may mention Dr. Watson, who, in his Lectures on the Practice of Physic expresses himself very decidedly on the subject. With regard to the acute paroxysm, he remarks that colchicum, judiciously given, may be fairly accounted a specific; and again, "This drug has certainly the property of easing, in an almost magical manner, the pain of gout. How it operates is not so clear. It is apt to produce nausea, faintness, and diarrhœa; but its curative influence is not conditional upon the occurrence of these symptoms. Sometimes the rapid disappearance of the gouty inflammation is its only perceptible effect. The patient may be in helpless agony with a tumefied red-hot joint, to-day; and walking about, quite well, to-morrow. The colchi-

cum is, therefore, plainly an anodyne." And as to its use in the more chronic forms, the same author observes, "I apprehend the proper way to eradicate the lurking residue of the mischief is to continue to give small doses of the colchicum; five minims of the wine, for instance, two or three times a day for a while." And lastly, that he looks upon its proper use in the intervals as likely to be attended with beneficial effects, will be evident from the following passage:—"As I think that the dregs, if I may so speak, left behind it by a gouty paroxysm, may be dispersed by the continued use of what, in the usual acceptation of the word, I may call alterative doses of colchicum (doses, that is, which produce the desired purpose gradually, and by insensible operation), so I think it probable that many a fit of the gout might be averted, if the remedy were given in the same way upon the first occurrence of the ordinary premonitory troubles."

Although I confess that a still more searching investigation, not only of the mode in which the action of colchicum is produced, but likewise as to the real effects of the remedy under different circumstances, is a desideratum, and one, I trust to be enabled one day to unravel—still, as the result of long-continued observation, I am of opinion that the following propositions can be established with regard to it, and may be acted upon with safety.

First, in acute gout.—Colchicum has a specific power

over true gouty articular inflammation, and may be given with advantage under such circumstances. It seldom fails to allay quickly all inflammatory symptoms, without the necessary production of any sensible physiological effect.

If cathartic action be required in gouty cases, it is better to combine some aperient with the colchicum, and not to trust to the influence of the latter drug, for when much purging and vomiting result from the colchicum, nervous and vascular depression likewise follows.

It is of advantage to give a full dose of colchicum at the commencement of the treatment; for example, half a drachm to a drachm or more of the wine, and to follow it up by smaller doses, as from ten to twenty minims two or three times a day, carefully watching its effect on the pulse, and never allowing the production of sickness or depression.

Colchicum, when injudiciously administered, gives rise not only to nausea, vomiting, and extreme depression, but occasionally to a very obstinate and peculiar kind of diarrhœa.

When great depression is produced by colchicum, gout is apt to recur soon after the patient has rallied from the effects of the drug.

In acute gouty cases the influence of colchicum should be continued in a mild and gradually diminishing degree for several days after the inflammation has subsided.

When colchicum is carefully prescribed, it has no

tendency to lessen the intervals between the gouty paroxysms or to render the disease chronic in character.

Secondly, in chronic gout.—Colchicum may be advantageously given in the exacerbations of chronic gout, but this should be done with great care, as there is less occasion to alleviate pain, and the patient is generally not so able to bear a lowering treatment; at the same time, it must be remembered that those who have taken colchicum for a lengthened period acquire a certain tolerance of the drug, a circumstance to be considered in apportioning the dose.

Thirdly, in the intervals between attacks of gout.—There is some evidence and considerable authority for regarding colchicum as effectual in warding off an attack of gout; especially when an approaching fit is beginning to manifest itself.

Colchicum may often be given with advantage to gouty subjects as a cholagogue in lieu of the preparations of mercury.

Value of different preparations of Colchicum.—The last question in relation to colchicum that requires discussion refers to the preparations best suited for employment, and upon this subject it is well that I should make a few observations. Whether the power of colchicum be due to its containing an alkaloid, as stated by Geiger and Hesse, or a neutral crystalline

body, as asserted by Oberlin, it is a matter of the highest probability that the same active principle pervades the whole plant, so that whether the powdered corm, or its wine or extract, or the tincture of the seeds or flowers be made use of, the very same remedy is virtually administered. This fact being established, much of the discussion regarding the relative virtues of the different preparations of the plant, although of high importance to the pharmacopolist, will possess but little interest to the therapeutist. It will be found, when watching the practice of those best able to judge of the effects of remedies, that one physician employs a preparation of the corm, another of the seeds, and a third of the flowers, and all are fully satisfied with the effects obtained; although it is true that some of the preparations are more powerful, dose for dose, than others, yet the difference is easily explained from the quantities of the drug made use of in their formation, as well as from the varying strengths of the different parts of the plant.

I have frequently prescribed with good and uniform effect an amorphous form of *colchicia* obtained from Germany, and the dose which has been found to answer best has varied from a thirtieth to a fifteenth of a grain, dissolved either in water or some aromatic vehicle. The only objection to its use is the absence of crystallisation, and I should feel much interest in substituting M. Oberlin's crystalline neutral principle, which, as appears from its chemical re-actions to be contained in the amorphous colchicia. In making

use of such a preparation we might feel assured that we were prescribing the drug in definite doses, without fear of the activity being influenced by season, soil, or any of the other circumstances which are liable to cause considerable alteration in the strength of the galenical compounds.

The preparations of colchicum which I have been commonly in the habit of employing are the wine and the acetic extract of the corm: the first is an advantageous form when the medicine is given as a draught, the second when it is administered as a pill.

I am fully persuaded that all the good effects derivable from the plant can be obtained from these two preparations, still others may at times be advantageously prescribed, as the simple and ammoniated tinctures of the seeds: the latter is useful when it is desirable to combine a vascular stimulant.

Most of the preparations have had their advocates; the acetic extract was introduced and favourably reported upon by Sir C. Scudamore, who considered it milder in its action than any other form, from the acetic acid exerting a modifying power over the active principle. It may, however, be regarded as a fact, that all the effects of the drug can be obtained from the proper administration of any one of its galenical forms, but it must be borne in mind that some are much more active than others.

A mode of giving colchicum, commonly employed, and answering more than one indication, is to prescribe a draught containing colchicum wine, the carbonate

and sulphate of magnesia, and some aromatic water. By means of such a combination we produce not only the specific influence of the colchicum, but at the same time keep up the secretion of the bowels and kidneys, and augment the alkilinity of the fluids.

White Hellebore.—Veratrum album, or white hellebore, has been prepared and used in place of colchicum, and a preparation of it with opium was at one time proposed as a substitute for the celebrated Eau Médicinale. The white hellebore is a plant belonging to the same natural order as the colchicum, and the rhizome, the part employed in medicine, contains an alkaloid, named veratria, a principle which is occasionally employed as an external remedy. Veratria was formerly supposed to be identical with the active principle of the colchicum autumnale, and hence it was natural to suppose that hellebore might possess a similar action to colchicum. It has however been recently proved that veratria and colchicia are not identical, that the former is much more irritating than the latter, and differs from it in chemical properties.

Sir C. Scudamore, who appears to have witnessed its effects, thought that the white hellebore was too dangerous a medicine to be familiarly employed, and that it could seldom be given with prudence to gouty patients; that even in careful and graduated doses it often caused serious hypercatharsis, great depression of strength, spasms, and cold sweats, and in some instances, tremors, faintings, and the sensations of

approaching death. I have had some opportunities of ascertaining the value of the white hellebore, as also of the alkaloid veratria in the treatment of gout, and the following case well illustrates the action of the latter :—

June 18, 1854. A patient 50 years of age, who had long suffered from gout, and had deposits of chalk and much distortion of the joints, was attacked at the above date with a severe fit; there was swelling and pain of both feet and right hand, and many of the smaller joints of the left hand and the elbows were more or less implicated. Pulse, 96; thirst. Ordered to take at 5 p.m. a draught containing $\frac{1}{16}$ grain of veratria dissolved in an ounce of water with a few drops of spirit.

The draught produced some slight nausea, but no other symptoms; at 10 p.m., $\frac{1}{12}$ grain of veratria was given, vomiting of a dark-coloured matter took place during the night, and the bowels, previously much confined, were relieved, partly perhaps by the veratria, but he had previously taken an ordinary senna draught.

June 19. Patient feels easier in all joints, but especially in left hand. Pulse 72, not full or hard; thinks he became relieved after the veratria. Ordered to take $\frac{1}{16}$ grain of veratria at 4 p.m.

June 20. Has taken three doses of veratria, no feeling of sickness, but a cup of tea has been vomited; many of the joints much more painful. Pulse 84,

fuller. To take $\frac{1}{8}$ grain of veratria three times a day.

June 22. After taking three doses of the medicine, felt intense thirst, burning and dryness of the mouth, but no purging or vomiting; the joints were worse than before. Since omitting the medicine, less thirst and dryness of the mouth and throat. Bowels open to-day, from a dose of house medicine.

The patient was then ordered a colchicum mixture, and after having taken it for 24 hours, the joints were greatly relieved.

Judging from this case, it would appear that the action of veratria, although carried to the extent of producing disagreeable thirst and dryness of the mouth, is attended with no real alleviation of the gouty symptoms; the slight improvement at first experienced by the patient probably arose solely from the relief of the bowels; but the colchicum subsequently administered, rapidly removed the articular disease, without the production of either thirst or dryness.

I have witnessed the administration of the wine of hellebore, followed by a similar result; it produced a burning sensation of the œsophagus, parched mouth, and intense thirst, accompanied by great depression, but without any alleviation of the gouty symptoms.

The difference between the active principles of colchicum and hellebore is also well exemplified by the following experiments made by MM. Geiger and

Hesse:—$\frac{1}{10}$ of a grain of *colchicia* dissolved in weak alcohol was given to a cat eight weeks old; much foam almost immediately appeared at the mouth; at the end of about an hour there were abundant liquid dejections, followed, after an interval, by vomiting. The gait of the animal became staggering, it fell, rolled from side to side, uttered a plaintive cry, and appeared agitated by convulsive movements. These symptoms gradually augmented, and death took place in 12 hours. On opening the body, the stomach and intestinal canal were found intensely inflamed and congested throughout. A $\frac{1}{20}$ grain only of *veratria*, given to a younger cat, caused the animal to stagger more convulsively, and die in 10 minutes; after death, no inflammation was found, except at the inferior part of the œsophagus, a portion of the canal not inflamed in the cat poisoned by the colchicia. In most of the fatal cases of poisoning by colchicum, a similar inflamed condition of the mucous membrane of the alimentary canal has been observed.

I think we may conclude from these observations, that although white hellebore belongs to the same natural order as the colchicum autumnale, its physiological and therapeutic properties are by no means the same, and furthermore that it is not a desirable remedy in the treatment of gout.

CHAPTER XII.

TREATMENT OF GOUT:—IMPORTANCE OF TREATMENT IN THE CHRONIC STAGES OF THE DISORDER — MEDICINAL TREATMENT OF CHRONIC GOUT — GENERAL SKETCH OF—VALUE OF SPECIAL REMEDIES—ALKALIES AND SALINES — DILUENTS — LITHIA SALTS PROPOSED AS CURATIVE AGENTS—THEIR SPECIAL ACTION AND ADVANTAGES—ASH LEAVES IN GOUT—TONICS — THEIR VALUE IN GOUTY CASES—PORTLAND POWDER—DISCUSSION OF THE LIABILITY OF TONICS TO PRODUCE INJURIOUS CONSEQUENCES — TREATMENT OF GOUT COMPLICATED WITH KIDNEY DISEASE — TREATMENT OF THE LOCAL AFFECTIONS — ŒDEMA — STIFFNESS OF JOINTS — CHALK-STONES — GOUTY ABSCESSES — DIET AND REGIMEN IN CHRONIC GOUT.

WHEN gout, instead of passing off as an acute fit, lurks about the joints, now attacking one, now another, with moderate intensity, but with the production of much stiffening and distortion, it has assumed a form to which the term chronic gout is applied, and one which requires a treatment considerably modified from that recommended for its acute manifestations. If it be necessary in acute gout to make the treatment dependent in a measure upon the peculiar state of the system or the idiosyncracy of the patient, it becomes a matter of much greater moment to attend to these circumstances in prescribing for the chronic forms; for a treatment, which in one case would be attended with essential advantage, in another might prove not

only useless, but positively injurious. In one patient the development of the gouty symptoms may be intimately associated with the state of the skin; in another, with the condition of the stomach and its appendages; in a large class of cases, a greatly augmented formation of uric acid is the chief cause of the malady, whereas in a smaller class the deficient excretion of this principle may be the most important feature of the disorder. All these considerations must be taken into account in successfully prescribing for the disease, and although a general outline of the plan of treatment is capable of being delineated, still the deviations from it must be necessarily numerous, and left to the judgment and acumen of the practitioner.

As we have before had occasion to remark, the use of colchicum in the early attacks of gout has been accused of inducing a chronic condition of the malady, but that such antecedent treatment is not essential for its production, I can affirm from my own experience, having recently met with a well marked instance of chronic gout in a patient who had experienced attacks for about fifteen years, but had never had recourse to the use of any medicines. In this case, the fits were at first short, and the intervals between them long, but after a time their frequency was increased, their duration prolonged, and the disease assumed a chronic form, accompanied with visible deposits; proving that there is a natural tendency for gout, gradually to assume a more severe and obstinate character, even when uninfluenced by medicines.

Although due attention to the inflammation of the joints must not be lost sight of in the management of chronic gout, still the constitutional treatment is of paramount importance, and should have reference to the morbid condition of the blood, and the removal of the impurities with which it is charged. This object is best effected by increasing the activity of the secreting organs, especially of the kidneys and skin; by altering the composition of the fluids, and rendering the abnormal matter less injurious, but above all, by obviating the circumstances which lead to the production of the disease.

With regard to the direct treatment of the inflammatory state of the joints, this can be successfully effected by the administration of colchicum in very minute doses, carefully avoiding depression, and attending to the precautions before detailed; but there are many cases in which other remedies are required, and among these iodide of potassium and guaiacum may be frequently had recourse to with advantage. It must be remembered that a low form of inflammation is often kept up in chronic gout from the presence of deposited matter, an action altogether independent of true gouty inflammation, and it is more particularly in these cases that the remedies alluded to prove most beneficial.

Iodide of potassium has undoubtedly a marked power in alleviating affections of the fibrous tissues, as is seen in the relief afforded in nodes; in many cases of gout, especially when the inflammation as-

sumes the character known by the name rheumatic, the remedy is of great benefit, acting on the fibrous tissues, and removing the remnants of inflammation. In sub-acute forms of rheumatism, iodide of potassium is peculiarly indicated when the pains are increased by warmth, and the same indication may be taken as a guide in chronic gout.

I do not consider that iodide of potassium possesses any appreciable power in removing deposits of urate of soda, but nevertheless I look upon it as a valuable agent in many cases. Mr. Spencer Wells states that he has employed the iodide with much advantage when joints have been enlarged, stiffened, and rendered painful by the presence of gouty deposits. The dose of iodide of potassium, sufficient for all the good it is capable of effecting, need not be large, from half a grain to a grain may be taken twice or three times a day, in water, or in combination with other saline remedies.

Guaiacum is a drug which may also be employed for the sake of its specific action on the fibrous tissues, and may be given in chronic forms of gout when the circulation is languid and the pains are relieved by the application of warmth. I have found great benefit in many such instances from this drug, and it is moreover a remedy which may be administered for a long time without producing mischievous consequences; for any unpleasant effects, as nausea or purging, which occasionally result, are at once made manifest both to the physician and patient. Guaiacum may be given either in the form of the Pharmacopœia mixture, or

as the simple or compound tincture, the ammonia contained in the latter being often beneficial, as it increases the stimulant action of the guaiacum upon the vascular system. When inflammatory symptoms are present, or when warmth increases the pain, the use of guaiacum is generally contra-indicated. Cases now and then occur in which guaiacum may be combined with advantage with iodide of potassium.

I have notes of numerous cases of chronic gout, in which guaiacum has been employed with striking benefit: it will be sufficient to select one for the purpose of illustration.

1860.—A gentleman, fifty-six years of age, without any known predisposition to gout, experienced the first attack about twenty years since, in the ball of the great toe; there was at least seven years' interval between the first and second fit, and three between the second and third. After this time the intervals were diminished. During the last three years the attacks have been much more frequent, and especially within the preceding six months; the fits have been also more prolonged, and the upper extremities have been affected as well as the lower. A small spot of urate of soda can be seen in the helix of the right ear, and there is some stiffness of one or two of the phalangeal joints of the fingers. The urine is free from albumen, and clear, yielding but a small amount of uric acid when acidulated. The pulse is weak, 84, there is no indigestion, and perspiration is easily induced; he has noticed that all

shocks to the system, mental as well as physical, are liable to bring on an attack of gout, and the fits have been more frequent in summer than winter. Guaiacum was ordered for this patient, in the form of the ammoniated tincture, rubbed up with mucilage, and he was also advised to take, occasionally, a grain of the acetic extract of colchicum, combined with a little quinine. Under the influence of this treatment, the progress of the disease became arrested, and now for nearly two years he has been but slightly troubled with gouty symptoms.

I have known many other cases in which the good effects of guaiacum have been equally marked.

Other stimulant remedies, as *mezereon* and *serpentary*, may be given to fulfil the same indications as guaiacum, either in the simple form, or as the compound decoction of sarsaparilla, which unites the virtues of these drugs as well as that of the sarsaparilla itself, and is a convenient method of exhibiting them. *Sulphur* has likewise been occasionally prescribed with the same view, and is now and then useful in chronic forms of gout.

To remove the abnormal state of the blood which invariably exists in chronic gout, and to restore the circulating fluid to a state of purity, must be our next object. It will be remembered that the presence of urate of soda in the blood has been shown to depend on two causes; first, its undue formation, arising from some form of dyspepsia or mal-assimilation,

secondly, its deficient excretion from the renal organs. These causes are often found combined, but in some gouty subjects the first is most prominent, in others, the second, consequently our treatment must be modified to suit the different cases. The undue formation of uric acid will be found to be especially influenced by diet and regimen, whereas its deficient excretion is more under the control of remedial agents; upon the latter we shall first discourse, but previously to so doing, I cannot help alluding to Sydenham's advice with regard to the treatment of gout, in which he remarks, that remedies, to be of service, must be steadily and perseveringly adhered to; that a change of the whole system is required which no sensible man can believe is possible to be effected in a short time: he then goes on to say, "For years together a man has drunk and feasted—has omitted his usual exercise —has grown slow and sluggish—has been over studious or over anxious,—in short, has gone wrong in some important point of life. In this case he has, as it were, taken trouble to pervert the various ferments of the body, and to smother the animal spirits, which are the primary instruments of concoction. Hence the humours preternaturally accumulated, break forth, after having become exalted in the highest degree. They destroy the system. The muscles are softened and the joints relaxed, so that the affluent humours are readily received. A new nature is now superinduced, the original and natural economy of the body being altogether broken up

and destroyed. The fits that seem so important in the eyes of the party, are nothing more than the series and order of symptoms which nature uses in the expulsion of morbific matters. Hence, to use any medicines for a time is a waste of labour. The weakness of all the digestions, and the loss of natural strength in the several parts, are the essence of gout. Each must be dealt with."

The remedies best adapted to purify the blood are those which increase the activity of the secreting organs, more especially the kidneys, as also such as possess the power of rendering the presence of the urate of soda less injurious by preventing its further deposition in the tissues or removing it when already infiltrated. To effect these purposes alkalies and salines are peculiarly called for, and many of them are of sufficient importance to demand a special inquiry into their nature and mode of action.

Alkalies and Salines.—Alkalies and salines have long enjoyed reputation in the treatment of chronic gout; Boerhaave and Hoffmann recommended them to be taken in small and frequently repeated doses for a long while, and for this purpose employed the ashes of different plants, burnt either to blackness or whiteness; for example, broom ashes dissolved either in water or Rhenish wine: they also used the alkaline earths for the same purpose. Cullen remarks that, when some fixed alkali, either in a mild or caustic state, or lime-water, soap or absorbent earths, have

been given in nephritic or calculous cases to patients who were at the same time subject to gout, it has been observed that, under the use of these medicines, they have been longer free from the fits of the latter disease. He adds, that he does not know, if when very long continued, they would prevent the returns of gout, as he had never ventured to give them for so long a period, fearful of producing a hurtful change in the blood. Dr. Wollaston, in alluding to his discovery of the real nature of gouty chalk-stones, and in referring to the opinion just quoted, says, "The knowledge of this compound may lead to further trial of the alkalies, which have been observed by Dr. Cullen to be apparently efficacious in preventing the returns of this disease; and may induce us, when correcting the acidity to which gouty persons are frequently subject, to employ the fixed alkalies, which are either of them capable of dissolving gouty matter, in preference to the earths, which can have no such beneficial effect."

Magnesia and lime have, nevertheless, been recommended in gout, and cases are on record in which the attacks appear to have been kept off for some time by steady perseverance in their exhibition.

Some physicians, on the other hand, have had no confidence in the administration of alkalies; but it will be found, that the opponents as well as the partisans for these remedies, have been considerably biassed by their respective ideas of the nature of the disorder; upon the whole, the recorded facts are in favour of benefit having been derived from their use.

In my remarks on the value of alkaline remedies, I shall include not only the alkalies and their carbonates, but also such neutral salts as the citrates and tartrates, which are decomposed in the blood, and render the urine less acid; in addition to these I shall speak of certain saline substances, as the phosphate of soda and phosphate of ammonia, which exert a specific action upon the renal and cutaneous secretions; but before entering at length into the value of these remedies, it will be advisable to say a few words in reference to the difference of action which they respectively exert.

It must be remembered that when caustic potash is administered in the form of liquor potassæ, the amount of the alkali capable of being introduced into the system is exceedingly minute, and its influence is probably exerted chiefly upon the mucous membrane of the stomach and its contents, and it therefore acts simply as a direct antacid and local sedative, the alkali absorbed being insufficient to render the urine either neutral or alkaline. But when the carbonates and bicarbonates of the alkalies are given, so much of the salts may be introduced into the stomach as not only to neutralise the acidity of the alimentary canal, but to render the blood more alkaline, and notably alter the secretion of the kidneys, and this is more especially observed after large doses of the bicarbonates.

The same phenomenon is observed when the common phosphate of soda is employed; a salt which

possesses an alkaline reaction and passes through the system apparently unchanged.

In the case of the citrate and tartrates the effect is different. These salts are neutral, and do not therefore possess the power of neutralising acid in the stomach, but, after their absorption into the blood, they are decomposed by the oxidation of the vegetable acids, and afterwards thrown out by the kidneys in the form of the carbonates of their respective alkalies.

As yet we have spoken of all the alkaline salts as exerting the same influence, but this is only correct up to a certain point, beyond which a difference of effect is distinguishable. Looked upon physiologically, potash salts act more especially upon the kidneys, and induce powerful diuresis; soda salts influence the liver more than potash salts, but act less upon the kidneys; and in a chemico-physiological point of view, the uric acid of the blood and urine is rendered much more soluble by the potash salts than by the corresponding salts of soda.

The influence of the potash salts as diuretics is well shown in some experiments of Professor C. G. Mitscherlich of Berlin, recorded in his Lehrbuch der Arzneimittellehre. This physician gave half drachm doses of carbonate of potash dissolved in six ounces of water, to a man suffering from prolapsus vesicæ. In half an hour the urine became neutral, and in 38 minutes alkaline. The quantities of urine which were secreted in each 20 minutes were as follow, measured in cubic centimeters :—

After the first	20 minutes	32	cubic cent.—	sp. gr.	1020
After the second	20 ,,	49	,,	,,	1014
After the third	20 ,,	75	,,	,,	1009
After the fourth	20 ,,	50	,,	,,	1014
After the fifth	20 ,,	30	,,	,,	1018

The total quantity in one hour and 40 minutes being 236 cubic centimeters, or a little more than eight ounces. The same patient, when not under the influence of the drug, passed, on an average, less than two ounces in the same period of time.

In another experiment the same man took 16 ounces of pure water, and the urine passed is exhibited in the following table :—

After the first	20 minutes	21	cubic cent.—	sp. gr.	1020
After the second	20 ,,	26	,,	,,	1015
After the third	20 ,,	51	,,	,,	1006
After the fourth	20 ,,	56	,,	,,	1004·5

Thus showing that pure water, although it augments the secretion of the urine, is much less active as a diuretic than a far less quantity of a solution of bicarbonate of potash.

No observations of the action of soda salts upon the kidneys in comparison with the corresponding salts of potash are on record, although the fact of this difference in diuretic action is, I believe, generally admitted.

Potash and soda salts differ also very notably in their influence on the blood, and more especially in their power of imparting solubility to uric acid. This might be at once inferred from the greater solubility of urate of potash, and may likewise be observed in

watching the effects of the two remedies in clearing the urine of patients from deposits of urates. The same fact may be illustrated experimentally; if, for example, small portions of gouty cartilage, infiltrated with urate of soda, be placed in solutions of the carbonates of the two alkalies, it will be found that, after the portion treated by the potash has become quite free from the urate, that immersed in the soda solution remains apparently in its original state.

Having established the influence of these salts in rendering the fluids of the body more alkaline, and in causing the solution of the uric acid, it is now a matter of importance to ascertain if the results of clinical experience accord with these facts. I should be inclined to lay great stress on Cullen's statement with regard to the therapeutic value of alkalies in the treatment of gout, because he was unfavourable to the idea of the disease being in any way connected with impurity of the blood, and he makes the statement merely as a result derived from actual experience of cases in which the alkalies were prescribed for a different purpose.

That alkalies are useful in treating acute attacks of gout is a fact recognised by almost every physician, and the exhibition of these remedies in such cases is very common; but it is a question of far more importance to determine whether, if their use be long persevered in, they exert a beneficial influence over the future progress of the disease. It may be well that I

should give the result of my own experience upon this point.

First, I am of opinion that alkaline remedies are of much value in the treatment of the paroxysms or exacerbations of the joint affection, and I am constantly in the habit of prescribing them in such cases, either in the form of the bicarbonate of potash, or of the citrate or acetate of the same base. I prefer the potash to the soda salts, because the former possess the same alkaline properties as the latter, and have a greater solvent power for uric acid, in addition to which the production of diuresis is attended with advantage.

In some instances in which magnesia is indicated, I have replaced the potash by this base, but for a short time only.

Next with regard to the continuance of the remedies when no inflammatory joint affection is present. I am convinced that much benefit may be derived from a judicious administration of salines continued for a long period, and can bring forward evidence in support of my conviction; but to render them successful in such cases a particular form of exhibition should be adopted.

If a patient suffering from chronic gout is exempt from active inflammatory symptoms, the following rules should be attended to:

The salines should be given in small doses, and repeated two or three times a day.

They should be administered in a *very* dilute form,

and always on an empty or nearly empty stomach, and some little while before food.

The nature of the saline must depend on the peculiarities of the case, and it should be changed from time to time.

Small doses are for many reasons preferable to large, when the continued employment of such remedies is desirable, as they produce no disturbance of the digestive organs, act more freely on the secretions, and are not likely to induce the debility, which is occasionally seen if they are given in considerable doses.

It is of much importance that the salines should be dissolved in a large quantity of liquid, and for this purpose I usually prescribe either plain or aërated water. The water itself is doubtless a powerful agent, and, if judiciously employed, of much service as a remedy; it is one perhaps too much neglected by physicians of the present day.

If water be given when the stomach is empty, it is rapidly absorbed by the veins, and quickly eliminated by the different secreting organs, whose functions are thereby greatly excited, and then, along with the augmented watery secretion, matters which would otherwise be retained, are thrown out, and the blood thereby rendered pure. I have reason to believe that the increased excretion from any organ is always attended with an augmentation not only of the watery portion, but likewise of the solid matter of such excretion; that when, for example, diuresis is

induced by any means, more of the peculiar ingredients of this fluid are at the same time eliminated, and that no such difference exists between diuretics as has been occasionally asserted, namely that one class merely augments the watery portion of the urine, whereas the other increases the organic and inorganic solids. We have evidence of the value of water as an active medicinal agent in the fact that mineral waters, holding in solution varying amounts of saline matters and salts of very different composition and characters, act equally efficaciously in relieving the same disease; a circumstance probably depending in a great measure on the powerful influence of the water itself. As the result of numerous observations I am of opinion that the free administration of water at proper periods of the day, diminishes the formation of uric acid in the system, at the same time that it promotes its elimination by the kidneys. When, for example, the urine of any patient is increased in quantity from this cause, the uric acid becomes notably lessened, certainly to a degree incapable of being explained by the fact of the solubility of the acid in the fluid, and the greater difficulty of separating it in the analysis. This view accords with the observations of Böeker and Genth, who found a marked decrease of uric acid under the same circumstances.

The reason why dilute saline solutions are more efficacious when taken on an empty stomach arises from their liability to produce dyspepsia if otherwise administered; water itself will cause indigestion if

taken soon after a meal, and the disturbance of the stomach will be further increased if an alkali be dissolved in it.

The choice of the saline is a point of some importance. I am inclined to regard almost all salines as beneficial, but some are certainly more adapted to particular cases than others. When the function of the skin is imperfectly performed, the salts of ammonia are peculiarly indicated, and the phosphate may be employed with advantage; it possesses also considerable solvent power for urate of soda, and there is much clinical evidence to prove its value in the treatment of chronic gout. It was first introduced as a remedy for this disorder by Dr. Buckler, of Baltimore, and since that period has been employed by several physicians with success. Within the last few years I have used the phosphate of ammonia very extensively, and am well satisfied with the results obtained from its employment in chronic gout.

If there be a deficient secretion from the kidneys, the salts of potash are desirable, on account of their diuretic properties; added to which they possess, as before stated, great solvent powers for urate of soda, and I am fully convinced that this latter property plays a most important part in the therapeutic action of the drug.

The phosphates of potash are not much employed, for the salt which corresponds to the common phosphate of soda is not one which is pharmaceutically convenient to administer.

The citrate of potash is also valuable and produces no disturbance of the stomach; it is agreeable to the taste, useful when a direct antacid is not required, and may be advantageously given in the effervescing form. The acetate is less pleasant, but is an efficacious salt. The tartrate in the majority of cases is not desirable, from its liability to run off by the bowels.

The chloride of potassium may be occasionally prescribed as a diuretic and solvent; it is a normal constituent of the blood, although in a much smaller proportion than chloride of sodium.

Having frequently prescribed saline remedies in the manner above described, I can speak most favourably of their value in chronic gout. I have repeatedly given them to patients who had for many years suffered annually from numerous severe attacks of the malady, with the effect of keeping them free from its return for a whole twelvemonth, and this exemption has been accompanied with a decided improvement in the general health. Upon the whole, I have found no other treatment so efficacious in cases of uncomplicated chronic gout, and it is one attended with this great advantage, that it can scarcely be regarded in the light of drugging, as no foreign body is introduced into the economy, but merely a slight addition made to the saline matters which are present in many articles of food, which are normal to the constitution of the blood, and even necessary to its healthy constitution.

In the case of a gentleman 50 years of age, suffering

from chronic gout and much crippled with chalk-stones, this treatment was followed with such good results that he was able again to enjoy field sports, from which he had been long debarred; and this improvement was in no way favoured by any very rigid adhesion to diet or regimen.

For such treatment to prove successful, it is important that it should not be indiscriminately used, and the cases should be properly selected: it is inappropriate for persons who are either greatly advanced in years, or whose kidneys are so injured and contracted that their power of eliminating the watery portion of the urine is much impaired; and lastly, it cannot be advantageously employed when the patient's stomach is unable to bear without discomfort dilute saline solutions; for if a feeling of distension and weight, or other symptoms of dyspepsia, is induced, the treatment will probably do more harm than good. It sometimes happens that when the simple saline solution does not sit easily on the stomach, it may be made to do so by the addition of some aromatic bitter, and a weak infusion of chamomile or of ash-leaves may be substituted for the water.

The salts of magnesia and lime may be occasionally used instead of the alkalies; their ordinary employment, in lieu of the alkaline salts, offers no special advantage, but on the other hand may be attended with discomfort; the first being liable to run off by the bowels, the latter to cause constipation. Instances, however, occur in which the administration of

one or other may for a while prove serviceable; in such the solution of the bi-carbonate of magnesia, or lime-water, may be had recourse to.

Lithia Salts in the Treatment of Gout.—Lithia was first discovered by Arfwedson in 1817, in the mineral Petalite, and was so named from λίθειος, stone-like. It has been since extracted from several other minerals, and has been found in many medicinal springs, as those of Carlsbad, Aix-la-Chapelle, Marienbad, Kissengen, Ems, Teplitz, Bilin, Kreuznach, Vichy, Baden, &c.

The metal lithium, of which lithia is the oxide, is of a beautiful white colour, like silver, readily oxidised by exposure to the air, of a specific gravity about half that of water, in fact lighter than any known liquid. It is also remarkable from possessing a very low combining proportion, its equivalent not exceeding seven on the hydrogen scale.

Lithia forms the third fixed alkali, and occurs as a white crystalline substance, having a caustic taste, and an intense alkaline re-action, similar to potash and soda. In some of its characters, lithia closely approaches these alkaline bases, in others it more resembles magnesia and lime. The proto-carbonate differs from the alkaline carbonates in being sparingly soluble in water, requiring about 100 parts; with excess of carbonic acid it is rendered more soluble. Lithia, when dissolved in 1000 parts of water, yields a solution having a well marked alkaline reaction.

As the equivalent of lithium is small, both the alkali

and its carbonate possess great neutralising powers, far exceeding in this respect the corresponding preparations of the other alkaline bases.

One of the most remarkable properties of lithia is its power of imparting solubility to uric acid, the urate of lithia being the most soluble of the known urates. It has been found by Lipowitz, that when the mineral lepidolite is reduced to powder and boiled with uric acid, so great is the affinity of the acid for this base, that urate of lithia is formed, although the alkali was previously combined with silicic acid.

I have found that when carbonate of lithia in excess is boiled with water, the addition of uric acid causes it to dissolve, showing that the urate of the base is more soluble than the carbonate. The salt formed under these circumstances is the bi-urate of lithia, which crystallises in long needles, and corresponds to the salt of soda found in the blood and tissues of gouty subjects.

Urate of lithia is much more soluble in water than any other urate, but to what extent has not been accurately determined. Lipowitz, however, found that one part of carbonate of lithia in ninety parts of water dissolved, at a boiling temperature, four parts of uric acid, with the evolution of carbonic acid, and that the salt so formed, when free from carbonate, dissolved in sixty parts of water.

Mr. A. Ure ascertained that a solution of one grain of carbonate of lithia in an ounce of distilled water, when raised to the temperature of 90° Fahr., and uric

acid gradually added in minute portions until it ceased to dissolve more, took up 2·3 grains, a quantity much larger than that dissolved by either carbonate of soda or carbonate of potash. Binswanger also found that one part of carbonate of lithia in 120 parts of water, dissolved at a blood heat nearly four parts of uric acid.

To show the power which carbonate of lithia possesses in rendering urate of soda soluble, I made the following experiment:—A metacarpal bone was selected, having the phalangeal extremity completely infiltrated with gouty deposit; this was placed in a small quantity of cold water, and a few grains of carbonate of lithia added; in the course of two or three days, when the head of the bone was examined, no deposit could be seen, and the cartilage appeared to have been restored to its normal state.

The lithia salts can scarcely be said to have been employed therapeutically until recently introduced by myself in the treatment of uric acid gravel, and chronic gouty conditions of the habit. Mr. A. Ure had proposed the use of the carbonate as an injection into the bladder, for the purpose of dissolving calculi, and in a paper published in the "Pharmaceutical Journal," August, 1843, gives an account of an experiment in which he found that a urinary calculus, composed of alternate layers of uric acid and oxalate of lime, when placed in a solution of four grains of carbonate of lithia in an ounce of distilled water, and steadily maintained at a blood heat during five consecutive hours, lost five grains in weight. The difficulty of procuring the salt

prevented Mr. Ure from pursuing his inquiries upon its action as a solvent for vesical calculi.

About four years since I commenced the administration of carbonate of lithia as an internal remedy, both in cases of uric acid diathesis connected with gravel, and likewise in chronic gout, and, from what I then experienced, was much satisfied with the results. When given internally in doses of from one to five grains dissolved in water, and repeated two or three times a day, it produces no direct physiological symptom, but, when patients are voiding uric acid gravel, it exerts a marked influence, causing the deposits either to become less or to cease altogether. In many instances in which I administered it to gouty subjects, the result was to diminish the frequency of the attacks, and to improve the general condition of the patients. These observations led me to propose, in the first edition of the present work, the salts of lithia as valuable remedial agents, and, although I was assured by those most competent to give an opinion on the subject, that it would be almost impossible to procure a single pound of the carbonate of lithia in Europe, I believe I am not in error in stating that notwithstanding its high price, more than a hundred pounds have already been therapeutically employed in this country. The value of lithia salts in the treatment of gout and gravel is based, first, upon the great neutralizing power of the alkali, arising from the low equivalent of this metal, and secondly, upon its powerful solvent action upon uric acid; in addition to

which its local influence is slight, and its use does not appear to be attended with any injurious consequences.

To demonstrate the superior power possessed by carbonate of lithia over the carbonates of soda or potash, in removing the deposits of urate of soda from gouty cartilage, I performed the following experiment. Solutions of the salts of lithia, potash, and soda, were prepared with one grain of each of the dried salts to the fluid ounce of distilled water; into these were placed small pieces of cartilage completely infiltrated with urate of soda, which were allowed to remain for forty-eight hours. At the end of that time, the cartilage taken from the lithia solution was found to have been restored to its natural condition, that from the potash was much acted upon, but that which had been submitted to the influence of the carbonate of soda appeared unaltered.

If the experiments be made with other salts of these bases, as the sulphates or chlorides, the powerful influence of lithia will be at once apparent: when, for example, the sulphate of lithia comes in contact with the urate of soda, decomposition ensues, sulphate of soda and urate of lithia are formed, and any deposit in the cartilage is thus rendered soluble.

In administering the salts of lithia, we should be guided by the following considerations:

They should be given in a freely diluted state, either dissolved in a large quantity of plain water, or, which is preferable, in aërated water, forming *lithia-water*, and

corresponding, except in strength, with the soda and potash-waters in general use.

When a large amount of an alkali is desirable, I have usually prescribed the carbonate of lithia in combination with some salt of potash, as the carbonate or citrate, which may be advantageously administered in the aërated state.

Carbonate of lithia can also be given with phosphate of ammonia; but it must be remembered that the phosphate of lithia is very sparingly soluble in water, and therefore in prescribing a combination of these salts, free dilution with plain or aërated water must be empoyled.

The great bar to the free use of salts of lithia in medicine has been their expense, but in the small doses in which they are usually required, this is seldom a serious objection. It is probable that should the employment of lithia in medicine be increased to the extent which may be reasonably anticipated, the supply of the drug will be greatly augmented, and its cost proportionally diminished.

Within the last two years the salts of lithia have acquired an additional interest, not only to the chemist, but also to the therapeutist. This interest has been excited by the extensive use which has been made of them in medicine, and by the recent discoveries of Kirchoff and Bunsen. I will give a short outline of these latter, as far as concerns the scientific physician, and relate the results of my own experience since I first proposed the salts of lithia as therapeutic agents.

By the old methods of analysis it was a matter of considerable difficulty to detect the presence of small amounts of lithia, but Bunsen, by means of the spectrum analysis, has shown that the detection of even the most minute traces of the metal can be easily accomplished, as lithium gives a well marked and characteristic red line, a pale yellow band, and a peculiar blue line at elevated temperatures. It has been shown that lithia, instead of being, as its name implies, a constituent of minerals only, is extensively diffused throughout the vegetable and animal kingdoms, and it has already been detected in the water of the ocean, in many mineral springs not mentioned above, in the ashes of sea-weed, and of many inland plants, as the vine, tobacco, and in the seeds of the gramineæ; also in the milk, blood, and the muscles of the human subject, and of many animals.

Lithia must therefore now be regarded, not as a drug foreign to the economy, but as a normal constituent of the body, and essential to its well-being.

The quantities of lithia existing in the above-named substances is small, but it is asserted that in some of the Baden-Baden springs, the Fettquelle and Murquelle, the amount is such as to render these waters not only powerful therapeutic agents, but useful as sources from which to procure the lithia salts.

My own experience of the action and uses of lithia may be thus summed up.

The carbonate of lithia appears to be a powerful diuretic, in some patients increasing the flow of urine

to a somewhat annoying extent; and I have known many instances in which a bottle of lithia-water, taken at bed-time, would cause the patient to be disturbed during the night, whereas the same quantity of soda-water would produce no such result.

The carbonate of lithia is likewise a very powerful alkalizing agent. In some patients I have seen the urine become distinctly alkaline from the exhibition of five grains of the carbonate dissolved in aërated water, and in numerous cases I have known the administration of the same salts prevent the deposition of uric acid gravel for an indefinite period of time.

I have also ascertained, from considerable experience, that the proper administration of lithia has a considerable power in preventing the recurrence of gouty paroxysms, and have heard of patients who asserted that when taking the alkali they could even indulge in wine with impunity. I have also been informed that individuals have lost gouty concretions by the long-continued use of the salts of lithia.

If we consider the pathology of the gouty paroxysm, and remember that in every case a deposition of a crystalline substance takes place in the tissues of the part affected, and if we then call to mind the great power of lithia, not only in alkalizing the blood, but likewise in rendering the uric acid soluble in that fluid, we shall have no difficulty in believing that the salts of this alkali may prove most powerful in the treatment of gout, and likewise in other affections,

the pathology of which is closely connected with an excess of uric acid in the system.

The citrate of lithia has been lately employed in medicine, and is a valuable salt when the presence of a free alkali in the stomach is not desired. It is a very definite crystalline substance, readily soluble in water, and devoid of any disagreeable taste. It exerts no alkaline power upon the stomach, but when absorbed into the blood is readily decomposed, and appears in the urine as a carbonate of the base, and thus produces all the remote effects of the last named salt. It stands, in fact, in the same therapeutic relation to the carbonate, as the corresponding salts of potash.

I may mention that although many of my patients have continued the use of lithia salts for a long time, I have never been able to detect any injurious effects. I have heard of the case of a gentleman who thought it produced some nervous symptoms, but this was not well made out: the patient notwithstanding continued the medicine, as it gave relief to his gouty symptoms.

I wish it particularly to be understood, that I do not consider lithia will in any way replace colchicum as a remedy for gouty inflammation; it may prove a valuable adjunct, but its chief use is in chronic gouty cases, to ward off attacks and remove the remnants of the disease; it is likewise valuable when administered as part of the prophylactic treatment.

Finally, lithia salts are of little or no avail in rheumatoid or chronic rheumatic arthritis, a disease often termed rheumatic gout; if administered in this affection their use will most probably lead to disappointment.

Fraxinus Excelsior; or, Common Ash.—Different parts of the Fraxinus Excelsior have at various times been employed in medicine; the bark was extensively used in the treatment of intermittent fevers before the introduction of cinchona into European practice; it was also employed in scrofulous and gouty affections, and intestinal worms. It is stated also, on the authority of Dr. Pouget, that the peasants of Auvergne have employed the leaves as a specific for gout for more than forty years.

M. Larue relates, that his mother was suffering in 1840 from a form of disease designated by him rheumatic gout; she had had it for two years, and it was gradually increasing in severity, accompanied with acute pain, much swelling, and great difficulty in moving the joints. After trying numerous plans of treatment without benefit, she was induced, on the recommendation of her milliner, to drink freely an infusion of ash-leaves. At the end of a fortnight she was relieved, and in a few months cured. M. Larue also states that in many other cases he had tried ash-leaves, and generally with complete success. The mode in which he gave the medicine was as a decoction of from 150 to 300 grains in about six ounces of water, and this quantity was taken night and morning,

or every three hours, according to the intensity of the symptoms.

Drs. Pouget and Peyraud consider the leaves of the ash a true specific in the treatment of gout, as not only possessing powerful curative properties, but as being devoid of all inconvenience and danger. As the result of a lengthened experience, they came to the conclusion that within four or five days of their employment, the pains, redness, and swelling were generally diminished, and often completely cured; and they assert that if given for eight or ten days each month, the attacks can be warded off almost indefinitely.

The above statements were made in 1852, and the value of the leaves has been confirmed by a M. Mouchon.

I have made some trials of ash-leaves in acute and chronic gout, employing them in lieu of other remedies, so as to be able to ascertain their true value, and the following is the result of my experience. A gouty patient, about 55 years of age, with chalky deposits on several parts of the body, was seized with a fresh attack, April 24th, 1854; on the 27th of the month he came under my care, having swelling, heat, tenderness, and pitting of the left hand, and the small joints of the fingers and wrist; the left knee was also inflamed, and febrile symptoms were present. He was ordered at once to take five fluid ounces of the decoction of ash-leaves three times a day. On the 29th, having taken the medicine regularly for forty-

eight hours, there was no alteration in the symptoms; the left elbow had become much inflamed, and the right ankle slightly so. Pulse 96, hard and full; much starting of limbs; furred tongue; some soreness of left ear, which was sprinkled with nodules of chalky matter; no sleep; bowels open from aperient medicine.

The medicine was then changed at patient's own request, as he stated that, from former experience, he was sure I could give him something which would relieve him. I ordered a colchicum mixture, and the gouty symptoms, within a few hours, were brought under complete control.

The second case resembles the first in many particulars. A man aged 38, who had suffered from gout for several years, and had a few spots of urate of soda on the palmar surface of one index finger, was next subjected to the treatment. The attack was becoming much more severe, and the day previous to his admission into the hospital, one elbow had been severely inflamed, in addition to the joints previously affected. On the 27th of April he was ordered the decoction of ash-leaves, five fluid ounces three times a day, which was taken regularly till the 2nd of May; it appeared to produce some nausea, but the gouty symptoms remained as before, and the ash-leaves were consequently ordered to be discontinued, and half-drachm doses of colchicum wine substituted. After two days the inflammation of the joints had considerably subsided, and in a very short time the man was free from gout.

These cases gave me little hope that ash-leaves would prove valuable in the treatment of the disease, and made me doubt the statements which had been made regarding them by Drs. Pouget and Peyraud, but, after administering the remedy in cases of chronic gout, I found reason to modify somewhat my views of their efficiency.

I have always given the ash-leaves in combination with a large amount of fluid, and am inclined to think that such a mode of administration has a powerful influence, as is the case with different saline substances. I ordinarily prescribe them in the following manner :—

An ounce of the leaves, as kept by the herbalist or druggist, should be boiled for ten or fifteen minutes in about two pints of water, and the decoction taken in divided doses during the day, about an hour before meals; its taste is by no means unpalatable, and several of my patients have drunk it instead of toast-and-water; it is slightly bitter, and appears to increase the appetite and improve the digestive functions.

If the ash-leaf tea does not replace the other liquids taken during the day, diuresis and diaphoresis are induced; sometimes a slight action on the bowels is excited, but ash-leaves given in this dilute form do not ordinarily produce any decided purgative effect.

In illustration of their value, I may mention that I once ordered them for a gouty subject, who had deposits upon the ears and hands, with great stiffness of the joints, and who had for a long time suffered

annually from five or six acute attacks of the disorder. By the aid of this medicine he was kept free from gout for more than a twelvemonth, and able to follow his usual occupation. He also recovered his power of walking, and could take considerable exercise.

In many other cases I have known good results to ensue, but few patients have persevered sufficiently long with the remedy.

As it may be troublesome to have the decoction daily prepared, I sometimes order it in a concentrated form, so that the virtues of an ounce of leaves are contained in an ounce of the concentrated decoction, and from two to three tea-spoonfuls of this solution may be taken in eight or ten fluid ounces of water three times a day. A small amount of spirit is required to preserve it for any length of time.

How ash-leaves act, I am quite unable to say. Do they produce more effect than an equal bulk of water? I believe the decoction sits more easily on the stomach than water, and this alone is a great desideratum; it appears also to act as a stomachic tonic.

In the urine of the patient above alluded to, an increase of the uric acid was observed, but unless confirmed by much further experience, I should not be inclined to lay stress upon the fact, as it might have arisen from other causes.

Stomachics and Tonics.—To prevent the undue formation of uric acid is equally as important as getting rid of it when present in the blood, and we must

endeavour to effect this, if possible, by the adoption of proper measures. This object is chiefly obtained by strict attention to diet and regimen; but remedies directed to the restoration of the digestive organs are often of much importance, as we have seen that in the human subject an augmentation of uric acid is intimately associated with some forms of dyspepsia. When there is evidence of a congestive state of the liver, it must be relieved by unloading the turgid vessels; to effect this, purgatives are useful, combined with small doses of colchicum, or with minute quantities of blue pill, to produce a cholagogue action; the same can often be effected by giving taraxacum freely, and keeping up its action for awhile. Small doses of the neutral salts may be advantageous, in conjunction with the last medicine, and if the patient be suffering from irritative dyspepsia, solution of potash may be given, combined with a little dilute prussic acid.

If at any time there is much want of tone in the stomach, bitters, and more especially those which are aromatic, may be either added to the other remedies or administered by themselves. For this purpose, infusions of chamomile, calumba, chiretta, quassia, serpentaria, cascarilla, and like substances are indicated, with the occasional addition of small quantities of the tinctures of ginger or capsicum, to give increased stimulus to the digestive organs; such infusions may, when advisable, be combined with bicarbonate of potash, carbonate of ammonia, or bicarbonate of soda.

When treating of the use of salines, we purposely omitted the consideration of the bicarbonate of soda, as it is a salt which possesses scarcely any solvent power over urate of soda, and is, therefore, in this respect very inferior to the potash salt. Still there are cases in which bicarbonate of soda may be useful, as it agrees with the stomachs of some patients better than the potash salt, added to which it seems to influence the secretion of the liver. I prescribe it in that form of gout which occurs in full habits, when the kidneys are but little implicated, and when the diathesis is strongly connected with derangement of the chylopoetic viscera. When depositions of urate of soda are rapidly taking place in and around the structures of the joints, or near the external parts of the body, I believe the free exhibition of salts of soda likely to add to the mischief.

In connection with the treatment by tonics, it is well that we allude to a once celebrated preparation, the Portland Powder, so named from its having been purchased by the second Duke of Portland, who, on account of the service it rendered him, distributed its recipe for general use. It consists of equal parts of the following five substances:—birthwort, gentian, germander, ground-pine, and the tops and leaves of the lesser centaury. The dose usually prescribed was a drachm, taken every morning fasting, for three months; after which it was reduced to three-quarters of a drachm, for another three months; then to half a drachm for the remainder of the year; after this the

same dose every other morning for the next twelve months, by which time it was presumed a cure would be accomplished.

It must not, however, be supposed that this mode of combating the symptoms of chronic gout was by any means novel, for we find that very similar means were adopted by the ancients; thus Aetius, Galen, and others were in the habit of employing bitters nearly akin to those composing the Portland powder, and Cælius Aurelianus even suspected they might do mischief. Sydenham likewise advises similar remedies, and gives a long list of plants which may be employed for the purpose, including among them angelica, elecampane, rue, chamomile, and juniper; many of them in their nature not unlike those before enumerated.

Heberden remarks, that this powder rose into favour too fast and too high to keep its place, but he thought that it had sunk into a state of discredit and neglect as much below its real merit as the first praises were above it. He was inclined to attribute this neglect partly to the largeness of its dose, which although almost too large for any body, was indiscriminately given to all, and, lastly, to its having all the natural ill-effects of the gout attributed to it, particularly paralysis and apoplexy, symptoms probably due to the disease itself. Heberden states that during the great vogue of this medicine, fits of gout were so frequently lessened, or found to miss their usual time of return, that few could have any doubt—he himself had

none—of the powder having produced these effects; while its having any share in the mischief imputed to it is devoid of certain proof, and in his opinion of much probability; he further remarks, "Nor indeed was its disgrace owing to its doing too little, but to its doing too much. The dread of being cured of the gout was, and is still, much greater than the dread of having it; and the world seems agreed patiently to submit to this tyrant, lest a worse should come in its room." Heberden considered that not less than fifteen grains should be given twice a-day, in peppermint-water, and that few would bear more than a two-scruple dose for a continuance.

The use of the Portland powder has been thought by some physicians to lead to much mischief; Cullen states that in every instance in which he had known it to be administered for the prescribed length of time, the persons who had taken it were afterwards free from inflammation of the joints, but were affected with many symptoms of the atonic form of gout, and all, soon after finishing their course of the medicine, were attacked with apoplexy, asthma, or dropsy, which proved fatal.

Dr. Cadogan likewise severely censured the use of the Portland powder, remarking that between fifty and sixty people with whom he had been acquainted, and who had been apparently cured by it, in less than six years had all died; but Dr. Mason Good, in commenting upon the opinion that bitters are mischievous for gouty subjects, makes the following very judicious

remark: "As Dr. Cullen gives us no account of any mischief which has followed the use of bitter tonics in constitutions marked by general debility and atonic gout, the evils he has described seem on his own evidence to be limited to those whom we have already cautioned against the employment of such a course. No proper classification or line of distinction seems to have been drawn or adhered to, which would probably have presented us with very different results if it had been, and have superseded the clashing and unsatisfactory explanation of atonic effects uniformly produced by a continuance of tonic medicines."

I cannot conceive that the exhibition of aromatic bitters in properly selected cases can lead to the evil consequences alluded to by Cullen and Cadogan, but at the same time I think that caution should be used in their exhibition. The more potent tonics—those which act on the nervous system, and especially the preparations of bark—have had their advocates in the treatment of chronic gout. Bark has been extravagantly lauded by some as a curative agent, but others have altogether condemned its employment. That it is not a specific, experience has assured me, and, moreover, it has often occurred to me to see a recurrence of the paroxysm follow its use, but whether dependent on the bark, I cannot positively assert. Sometimes I have given the medicine in the form of the decoction, sometimes as the sulphate of quinine.

One point of interest in relation to this subject is,

that quinine has been stated by Dr. Ranke to diminish the secretion of uric acid by the kidneys; if this be the case, the diminution must depend either upon its lessening the formation of this acid in the system, or checking its excretion; if the latter be true, we should expect to find quinine and bark injurious in gouty cases, but if the former be the explanation, these drugs should prove of essential service. I have repeated Dr. Ranke's observations, but my results were not altogether in accordance with those obtained by him. There was, however, some difference in the mode of administering the sulphate of quinine; he gave only one large dose, about fifteen grains; I administered the salt in divided doses.

In one patient, a young man, recovering from a slight attack of colic, the amounts of uric acid eliminated by the kidneys under the full diet of the hospital and without medicine, during four days, were 5·04 grains, 7·44 grains, 6·86 grains, and 9·22 grains. Three seven-grain doses of sulphate of quinine were then administered, and only 4·10 grains of uric acid were eliminated on that day; and on the following four days 7·68 grains, 7·70 grains, 6·53 grains, and 6·50 grains were secreted. For the next two days, six grains of the quinine salt were given three times each day, and the amounts of uric acid were 8·64 grains and 5·24 grains, and for the following three days, 5·85 grains, 6·84 grains, and 6·20 grains. It was only, then, on the first day, that any sensible diminution in the secretion of uric acid occurred; if

the average passed with and without the quinine be estimated, the figures will not be found to differ widely from each other.

In another case, a patient without medicine was passing 6·03 grains and 5·23 grains of uric acid on two consecutive days. When taking 18 grains of sulphate of quinine in divided doses during three days, he threw out 5·58 grains, 5·76 grains, and 4·76 grains, and the next two days without the drug, 5·59 grains, and 6·69 grains of uric acid. The average without medicine being 5·89 grains, and when quinine was taken, 5·37 grains.

Dr. Ranke's skill as a physiologist is so well established, and his experiments so decisive, that I should not wish for a moment to cast a doubt upon their accuracy, but would rather wait the result of further observation before forming an opinion on the subject. I cannot, however, help thinking that the decrease which occurs on the administration of the medicine is due rather to a sudden impression upon the nervous system causing the quinine to influence the excretion of uric acid, than to any deficient formation of this principle.

The last tonics we shall refer to are the ferruginous salts.

These preparations when indiscriminately given to gouty subjects are apt to excite paroxysms of their disorder, and are for the most part contra-indicated; but cases occasionally present themselves, accompanied

with want of tone and an anæmic state of habit, in which their careful exhibition is attended with advantage. When iron is needed, those preparations should be selected which produce the least possible disturbance of the stomach. Cullen preferred the rust or oxide; those which I have found most beneficial are iron reduced by hydrogen, the Fer reduit of the French, or the Ferrum redactum, and the carbonate of iron dissolved in water by an excess of carbonic acid. The citrate of iron, combined with some saline, is likewise useful. Mineral waters of the ferruginous class, as those of Schwallbach, Spa, Pyrmont, may also be beneficially employed, as the large amount of water tends to keep the secretions free. It is important that great attention should be paid to the condition of the bowels during the exhibition of iron preparations.

Treatment of Gout when accompanied with Albuminuria.—We have before had occasion to notice the frequency of the occurrence of a small amount of albumen in the urine of patients suffering from gout; this circumstance should be taken into account in its treatment, as by so doing we can often not only afford great relief, but sometimes render a disease tractable, which would otherwise prove unmanageable. Counter-irritation to the loins is a remedial measure I frequently have recourse to in such cases: for this purpose I commonly advise either the application of mustard poultices across the loins, or a stimulating liniment sprinkled on impermeable cloth. Now and

then I prescribe a hydrogogue composed of bitartrate of potash and jalap, and at the same time direct especial attention to the functions of the skin.

I have records of many cases in which this treatment has proved most valuable, but will select only one for illustration.

July, 1861.—The patient, a man aged 32 years, a master plumber and painter, who inherited gout from his father and has two brothers suffering from the same disease, all of them painters by trade.

Some years since he suffered from three or four attacks of lead colic.

About six years since he first experienced gout in one knee, soon afterwards a second fit in both ankles and a knee; the attacks have latterly become so frequent that he has scarcely had a month's interval. One peculiarity of this case consists in the fact of the great toe never having been implicated, and another feature is the readiness with which the patient is affected by mercury. During the last two or three years the upper extremities have been affected, and although there is no marked stiffening or distortion of any joint, still there is evidence of deposition of urate of soda from the occurrence of specks of this salt in the helix of each ear.

The urine is copious, clear, specific gravity 1013, and contains a notable quantity of albumen.

This patient was ordered to apply mustard poultices to the loins each other night, or as frequently as he could bear them; he had likewise a saline prescribed,

and the result of this very simple treatment was that up to the present time, June, 1862, he has remained free from any farther attacks: this freedom cannot be ascribed to any change of diet, for this patient for a long time had given up the use of alcohol in any shape. I have no hesitation in ascribing the great improvement to the influence of the counter-irritation upon the loins, relieving the renal organs.

In connection with this subject I may mention a somewhat curious fact, namely, in certain cases, gin, which usually has little influence in exciting gouty paroxysms, will occasionally do so when there is much renal complication; this probably depends on the juniper oil or turpentine contained in the gin, causing irritation of the kidneys and increasing the congestion of those organs.

Treatment of the local Affection.—We have already shown, in our third chapter, that chronic gout is often attended with much local mischief, which we there fully described. To such an extent does this sometimes proceed, that life may be rendered miserable. It is stated that in the case of the Emperor Galba, his hands and feet were so much distorted that he could neither wear a shoe, nor even hold a small book; and he is reported to have said, "When I stand in need of eating I have no hands; when walking is necessary I have no feet; but when I am to be tormented, then feet and hands are all ready."

It has long been a prevailing opinion, not only

among physicians, but the public also, that when chalky deposits appear on the surface of the body, or when a case is such as to be termed one of chalky gout, no cure can be expected. Hippocrates and Aretæus entertained this view, and Ovid has recorded the same in his epistle from Pontus, in which it is stated,—

Tollere nodosam nescit medicina podagram.

And in proof that even at no very distant period the same opinion was held, we find Horace Walpole, himself a sufferer, saying in one of his letters: "I have so good an opinion of the gout, that when I am told of an infallible cure, I laugh the proposal to scorn, and declare I do not desire to be cured. I am serious; and though I do not believe there is any cure for that distemper, I should say the same if there were one, and for this reason I believe the gout a remedy, not a disease, and being so, no wonder there is no medicine for it—nor do I desire to be cured of a remedy."

As the physician is often consulted by patients suffering from the consequences of chronic gout, including not only chalk stones and abscesses, but rigidity of the joints and other sequelæ, I will endeavour to explain the best mode of dealing with these various forms of local mischief. Sydenham was of opinion that under the influence of daily and long-continued bodily exercise, not only were tophi prevented from forming, but indurated tumours even of considerable standing occasionally disappeared; at the

same time he remarks, that this only ensued in cases where the chalky tumours had not converted the skin into a substance like themselves.

Boërhaave has an aphorism to the effect that good may be done by proper treatment, even in the tophaceous variety of gout, and others have entertained still more sanguine expectations from remedies.

False ideas of the composition of gouty concretions led at one time to the use of acid lotions, and a mixture of hydrochloric acid and oil of turpentine was occasionally employed.

Alkaline remedies, however, gained most favour, notwithstanding that an explanation of their value was not reconcileable with the idea of chalk-stones being of the same composition as bone earth, and we find Aetius making use of a mixture of quicklime and nitre (probably an alkaline carbonate) mixed with lard. Trallianus also employed a similar compound, and Van Swieten made a composition by heating together crude tartar and quicklime, a solution of which in water he applied to the gouty tumours, and asserted that it was followed by remarkably good effects, and sometimes in the course of a few days by the total dispersion of the swelling.

Sir C. Scudamore, from considering the easy solubility of uric acid in a solution of potash, was led to the employment of it as an external application, and remarks that in three instances of recent deposit, it was so successful that the concretions which had been visible under the skin were gradually removed; he

ordered the solution of potash to be mixed with at least an equal quantity of recently-prepared almond milk, and rubbed on the part two or three times a-day.

When chalk-stones were of long standing, he considered that, although much less could be accomplished, still the case should not be abandoned, and that even then the alkaline liniment might diminish the size of the tumours, and increase the mobility of the joints.

One of the more common and slighter sequelæ of gout, if the inflammation has lingered, is an œdematous state of the limb, and this is more especially seen in the lower extremities, and probably often proceeds from the vessels having been weakened; occasionally, however, this condition is either dependent on or at least much increased by some defect in the secreting power of the kidneys.

The œdema, if dependent on local debility, is best remedied by the use of elastic stockings, combined with gentle friction with some slightly stimulating application, as camphorated oil; at the same time the limb should be elevated as much as possible on a foot-rest, to facilitate the free return of blood by the veins. If the kidneys be in fault, a condition generally indicated by the presence of a trace of albumen in the urine, other remedies may be required, and the vapour or hot-air bath, saline diaphoretics, with gentle counter-irration to the lumbar region, are of great service.

If stiffness of any joint be left as the result of a gouty fit—and we have seen that even partial anchylosis may be caused by a single attack—then local treatment must be had recourse to, consisting in the use of friction and passive movement, but short of inducing tenderness of the joint. The friction may be effected with some simple lubricating embrocation, made more or less irritating by means of ammonia or an essential oil; occasionally, under these circumstances, small blisters are productive of much advantage.

In using mechanical appliances to joints stiffened by gout, the cause of such rigidity should never be lost sight of, for injury may be induced by a too harsh mode of procedure; gentle means, continued over a lengthened period, are most likely to be attended with success. In such cases the use of mineral baths, as those of Aix-la-Chapelle, Wiesbaden, Teplitz, Buxton, and Vichy, are often of considerable benefit, and douche baths and shampooing are specially indicated.

Now and then I have prescribed lint dipped into a weak solution of carbonate of potash, to be wrapped round the stiffened joint and kept moist by oil silk, and occasionally I have seen distinct relief afforded by this treatment.

It must be borne in mind that the stiffness and tenderness of the joints is generally dependent on two combined causes, partly on the urate of soda which has been deposited in the ligaments, and partly on a chronic form of inflammation closely resembling ordi-

nary inflammation, which is kept up by the presence of the foreign matter; the latter condition is capable of relief by the aid of counter-irritants and friction, combined with the internal use of iodide of potassium; the former is difficult to remove, but possibly the long-continued use of a potash solution, or still better of one containing carbonate of lithia, might have some power in effecting this object, especially if aided by the employment of properly selected internal remedies.

When chalk-stones appear on the surface, the question of the possibility of their removal by treatment is often mooted, and the following is a summary of what may be done in such cases.

When the ears of gouty patients, exhibiting the pearl-like nodules upon the helix, are watched, it will frequently be found that in the course of a few months a considerable change takes place, arising from the falling off of old and the formation of new deposits, and this change is sometimes caused by the unintentional picking or rubbing of the ears. These concretions, it will be remembered, are produced by a liquid exudation into the fibro-cartilage, which afterwards hardens, and the integument covering the cartilage being thin, is easily penetrated, the nodule detached, and a natural cure thus effected. The ear, for example, represented in Plate I., fig. 2, had undergone many changes during the time the patient was under my own observation. If it be desirable on account of the size of any such deposit to remove it speedily from the ear, this can be accomplished, if it

be semifluid, by puncturing with a lancet, and squeezing out the crystalline matter by the aid of slight pressure; if the concretion is older, it can be detached in little hardened masses consisting of aggregated crystals. On account of the little susceptibility of the ear to take on inflammatory action, such treatment is not followed by any injurious consequences. Now and then small tophi may be separated in the same manner from other parts, but in doing so we should be careful to ascertain if they possess a deep origin, as this circumstance greatly influences the facility of the after healing.

When concretions are formed around joints, and project so as to be of much inconvenience, forming tumours more or less resembling those delineated in fig. 8, p. 61, and fig. 9, p. 73, it may occasionally be prudent to puncture them with the lancet, taking care to make small incisions, and not to use much subsequent pressure in removing the creamy matter. Such incisions will often heal by the first intention; if not, the part may be kept moist with water-dressing, or a bread poultice, and then after a short time allowed to heal.

Occasionally, when incisions have been made, and more frequently when the tumours have burst of themselves, the sores become troublesome, and remain open for a long time. This obstinacy arises from the deposit being deep-seated, and from its continuing to approach the surface in order to be discharged;

besides this, when air has been once admitted, the formation of pus generally ensues, which adds to the difficulty of healing. Under these circumstances the application of nitrate of silver is of use to restore healthy action.

Mr. James Moore, in his communication to the Medico-Chirurgical Society, recommends that when a severe fit of gout attacks a part in which there is an accumulation of chalky matter, a warm poultice should be applied, and if there be any threatening of gangrene, which I may observe very seldom happens, he advises stimulants and opium to be administered. If the cutis over a deposit opens, but leaves the chalky matter confined by the cuticle, he thinks a puncture should immediately be made, but that it is imprudent to touch the skin itself with the lancet, or even to make a large opening into the cuticle. He is also opposed to the use of much pressure for the purpose of squeezing out the gouty matter, and says that even a small puncture will permit a portion of the fluid to escape, and that more will run out into the poultice, and thus the tumour is removed, and the symptoms commonly improve. When the inflammation has subsided, greater freedom can be used: some portion of the cuticle may be removed to facilitate the discharge, and gentle pressure also employed. If an ulcer has much chalky substance at the bottom, this should not be attempted to be got rid of by the knife, as it may cause gout, or set up inflammation, and, as the deposited matter is in separate cells, an incision

would remove but little of it. Caustics, employed with caution, answer better, for, by destroying the cellular membrane that confines the urate of soda, it often enables it to escape. Mild dressings only should be applied, as all stimulants are hurtful. It should be borne in mind, in order to prevent disappointment, that these ulcers are often of long duration; this can be readily understood when it is remembered that not unfrequently the deposit of urate of soda extends from the surface down to the joint itself, a fact readily seen on reference to the drawings in Plate III., figs. 2 and 3.

In concluding our remarks upon the local treatment of gouty chalk-stones, I may add, that it is a judicious rule to interfere with them as little as possible by surgical means, as small advantage can be obtained, and great mischief occasioned.

Diet and Regimen in Chronic Gout.—Of the importance of a regulated diet and attention to regimen in the cure of chronic gout, in order to prevent the returns of the disorder, there can be but one opinion, all experience and authority are in its favour. Galen affirmed that it was impossible to cure those who indulge in eating or drinking, because by their intemperate way of life they are constantly adding to their disease, and Sydenham wisely said, that however valuable remedies were in chronic gout, they were insufficient single-handed, and need be accompanied with great care in diet; in alluding

more particularly to his own case, he remarked that moderation in eating and drinking must be strictly attended to, in order that the stomach may receive no more food than it can easily digest, and no fresh fuel be thereby added to the disease. Sydenham at the same time considered that the opposite extreme was equally injurious, as he had experienced in his own person; for abstinence, says he, weakens the parts, by withholding from them their due proportion of that aliment which is necessary for supporting their vigour and strength. Cullen, although doubting the power of medicines, thought that much might be done by proper attention to regimen, feeling fully persuaded that any man who commenced in early life a constant habit of bodily labour and abstinence from animal food, would be preserved from gout, even if he inherited it.

In chronic gout the rigid diet, so necessary in the acute paroxysms, must be replaced by one capable of supporting the strength of the patient; but as all nutriment which exceeds this is productive of injury, there is no little difficulty in correctly apportioning the food. In respect to this point no better rule can be laid down to the gouty subject than that of Sir William Temple, who remarks, "Simple diet, limited by every man's experience to his own easy digestion, and thereby proportioning as near as can be the daily repairs to the daily decays of our wasting system."

As the exacerbations of gout abate, the diet may be gradually improved; some of the farinaceous matter

replaced by fruit, fish, or fowl, and afterwards by meat; it is of much consequence to avoid all indigestible dishes, and especially such as contain free acids, as these are apt to cause a recurrence of the paroxysm. The use of an exclusively vegetable diet has occasionally been recommended in the treatment of gout, and cures have been related in which, by its employment alone, patients were not only kept free from inflammatory symptoms, but their chalk-stones have also disappeared; notwithstanding this improvement, a return to an animal diet was immediately followed by an accession of the disorder. Experience has clearly shown, that gout cannot be successfully treated by abstinence from meat, although a careful restriction as to quantity, so as not to exceed that which is necessary for the proper sustenance of the body, is of much importance. Examples are not wanting in which gouty persons have entirely regained their health by being reduced to poverty, and obliged by daily labour to gain a spare sustenance; and Cornaro is said to have freed himself from gout and to have lived to be a hundred, by diet alone, although he did not commence his change of living until he was more than forty years old. Such a sudden change, although occasionally successful, would, in many instances, bring on a paroxysm of the disease, and not unfrequently be dangerous.

One of the best methods of limiting the quantity of animal food is to make the number of dishes few, as mixtures of different meats are not only more difficult

of digestion than an equal quantity of one sort, but the appetite, when tempted, often desires more than the stomach is capable of digesting properly.

The most digestible meats, as mutton, well kept beef, and poultry, with the white kinds of fish, as cod-fish, sole, and whiting, may be partaken of; salmon, veal, and pork should be avoided, as well as salted meats, cheese, and raw vegetables, which, with highly seasoned dishes and rich sauces, are likely to induce dyspepsia.

Potatoes, valuable in giving constituents to the blood which are essential to its healthy composition, as likewise boiled greens, turnips and carrots, may be eaten sparingly.

All stone fruits, apples and pears, unless baked, should be ignored, but strawberries, grapes, oranges, and other succulent fruits may be enjoyed in moderation. Strawberries were even stated by Linnæus to prevent the occurrence of gouty attacks when habitually taken. Sub-acid fruits owe their efficacy to the alkaline salts they contain, which are decomposed in the blood, and appear in the urine chiefly in the form of carbonate of potash, and thus stimulate the kidneys to increased action.

Not only the character of the diet, but the time of taking food must be regulated; it is desirable, if possible, that the gouty man should dine in the middle of the day, or not later than three or four o'clock; brown meat should be taken at that time only, except when circumstances render its more frequent exhibi-

tion advisable, and late suppers should be avoided. In speaking of animal food, I would not include either an egg at breakfast, when it agrees with the stomach, or in some cases a small rasher of broiled bacon, carefully avoiding the lean portion, which is of difficult digestion on account of its hardened fibre.

Wine and malt liquors must not be allowed; if alcohol in any form be requisite, a little weak brandy, whiskey, or gin and water may be taken; it is frequently necessary to make exceptions, as from long habit some stimulus may be essential to the proper performance of digestion; in such instances, a little sound sherry, as Amontilado, or Manzinilla, is best. Port wine should be absolutely forbidden, and except in peculiar idiosyncracies, Hocks, Moselle, clarets, and similar wines should be shunned, but it now and then occurs that these latter wines agree with the patient better than sherry, and the same remark applies to good Madeira. It is of the greatest moment in all cases, that the patient should observe extreme moderation; one or two glasses of wine taken with the principal meal is generally sufficient, but the amount cannot always be specified, and must necessarily depend, not only on former habits of life, but also upon the age and strength of the patient, and other constitutional peculiarities.

Sydenham, in alluding to this subject, says that at least the first part of the old saw is true, "If you drink wine you have the gout, if you do not drink wine the gout will have you."

The objections to the use of malt liquors, as ale, beer, and porter, are equally strong, if not stronger than those which are urged against wine. I have known several patients in whom the attacks were much prolonged by their partaking of such beverages; and not only does it lengthen the paroxysms of chronic gout, but gives a great tendency to their return. I remember a gentleman who was experiencing attacks every six or eight weeks, who simply by avoiding pale ale kept them off for more than a year, and some of the most chronic and inveterate cases I have ever met with, have been in persons who had brought on the disease solely by the use of strong malt liquors. It is by no means unusual to find such instances among the men connected with large breweries. When in the least degree hard or acid, malt liquors act powerfully in exciting the gouty paroxysm.

Milk has been especially recommended for the gouty, and it might naturally be supposed that from its nutritive powers and unirritating nature, it would prove beneficial. It appears that in many cases a milk diet has been of much service, especially in the young and strong, but in some instances it has entirely failed, and in old people its adoption may do harm. Sydenham remarks with regard to a milk diet that "It has done good as long as it has been rigidly attended to; the moment, however, that the patient swerves from it a hair's breadth, and the moment he betakes himself to the diet of a healthy

man (no matter how mild and simple), the gout returns worse than ever."

Of tea and coffee in gouty cases little need be said, they should be taken in moderation and not too strong; if they cause indigestion, as is sometimes the case, cocoa may be substituted for them. It has been suggested that coffee may possess the power of preventing gout, seeing that in countries where it is extensively drunk, as in Turkey, gout is scarcely known; but it must be remembered that in such countries, little wine or malt liquors are taken, and this fact would satisfactorily explain the exemption from the disease. The same may be said of tea, and of the exemption from gout attributed to the Chinese.

Exercise is most important in gout, as inactivity tends powerfully to engender a state of system leading to its renewal; in the chronic form it is of great moment, and likewise in the intervals between the attacks. Sydenham's opinion of exercise is frequently expressed in his treatise, and in one passage he says, "Moreover, much as the pain and the great inaptitude for motion may seem to contra-indicate that remedy which I have so much extolled—exercise—it must still be undergone; since, although at the beginning of a fit it may appear impossible for the patient even to be carried to his carriage, much less to bear the motion of it, he will nevertheless, provided he make the attempt, in a short time feel as little pain when driven about in his coach, as when seated in his

elbow-chair at home." And again, "In respect to the kind of exercise, riding on horseback, unless forbidden either by old age or a calculus, is by far the best. Indeed, I have often thought within myself, that if any person knew a remedy of which he wished to make a secret, equally efficacious in gout, as riding, or regular and steady riding on horseback, he might make a fortune."

For exercise to be useful in gout it should be moderate and regular; if excessive at any one time, it may produce injury, and, if not regular, or if its effects on the system be not kept up, it is of little value. Foot and horse exercise are both good, carriage exercise less so, but still of much advantage when the others cannot be employed. Friction may occasionally be substituted for exercise when the latter cannot be taken to a sufficient extent. Sir William Temple remarked, that no one need have gout who could afford a slave to rub him; without going to this length, it is certain that no inconsiderable advantage may be thus obtained.

In all cases the amount of exercise must be carefully apportioned to the age and strength of the patient; although exercise has been occasionally advised and even practised at the commencement of a gouty fit, as in the case related by Van Swieten of a dancing master, who, having suffered twenty years from gout, kept his joints free from stiffness by getting out of bed and walking about as much as he could the moment he perceived the least remission of pain, and

continued this every day,—still the practice is not unattended with danger, and cannot be recommended; besides which few patients can be found having the moral courage to pursue it.

Fresh air is highly valuable, especially to those of weak habit; sometimes, when all other remedial and dietetic means have failed, fresh air has effected the desired object. A bracing air, such as is obtained in elevated localities, is peculiarly advantageous to many such subjects, and probably part of the benefit derived from a sojourn at mineral springs thus situated is due to this cause.

In certain cases, where the attacks are peculiarly dependent on the state of the skin and readily excited by the bleak east and north-east winds, change to a warmer climate becomes desirable, and the intervals of the fits may often by this means be occasionally greatly lengthened. Instances indeed have been known in which a complete change of residence to a warmer locality has altogether prevented the returns of gout, and from my own experience I feel assured that this step is often most beneficial. Although gout is not very prevalent among Europeans in India, still the influence of a change of climate will by no means permit immoderate indulgence, and in proof of this it will be found that gout is not uncommon in our own army in the East.

Upper Egypt and Malta are favourable places for residence during the winter and early spring; some parts of Italy and Spain are also well fitted for gouty

patients; but the selection of the locality must depend much on the peculiarities of the case, as a climate found beneficial to one person may occasionally be productive of ill consequence to another; a circumstance easily explained by the facts before advanced concerning the nature and causes of the disorder. Exercise, fresh air, and change of climate produce their beneficial effects by giving tone to the stomach and digestive process, by increasing the functions of the different secreting organs, and at the same time by imparting strength both to the nervous and muscular systems.

The cutaneous function must not be neglected either during the existence or in the interval of chronic gout; the clothing should be sufficiently warm to ensure the surface from being chilled, and the feet should be particularly protected; flannel should be worn next the skin, and likewise woollen stockings, but any undue warmth or overheating of the body carefully guarded against. The action of the skin may at times be advantageously excited by warm baths, by sponging the body with tepid water, or still better, with salt or sea water, followed by friction with a coarse towel. The importance of a proper attention to the skin will be at once evident, when we reflect that it is by means of this surface that much acid matter is constantly excreted, and that when the cutaneous function is suppressed the blood becomes less alkaline, and a fit of gout may be thereby occasioned: for this reason cold often acts

as an exciting cause of gout, and warmth tends to ward off the disease.

Lastly, the influence of the mind on the development of gout must not be lost sight of. Any mental disturbance tending to depress the nervous system is certain to be followed by injurious consequences to gouty subjects, and it is therefore of great moment in the treatment of gout, that all such influences should be carefully avoided, and the tranquillity of the mind as much as possible ensured. For this purpose late hours should be shunned, study and the cares of business laid aside, and the mind employed with pleasant thoughts and occupations. The fact that prolonged mental exertion of any kind powerfully affects both the assimilating and digestive functions is well established, and that such must necessarily exert a baneful influence on the progress of gouty affections is equally certain. Sudden and violent emotions have occasionally been followed by an instantaneous relief of the paroxysm, but they are likewise apt to prove dangerous and should be carefully guarded against. In illustration of the effect occasionally produced by violent mental emotion, I may instance the case of a man recently under my care, who, when suffering severely from a third attack of gout, had a quarrel, leading to blows: the intense effort appeared to cause the rapid subsidence of the gouty inflammation, and the patient afterwards remained free from the disease for several years.

In concluding my remarks on the management of chronic gout, it may be desirable to give a brief summary of the principal indications necessary to be fulfilled.

First, to treat the chronic inflammation of the joints by means less heroic than those employed in the acute disorder.

Secondly, to render the blood pure by augmenting the various secreting organs, more especially the kidneys and skin.

Thirdly, to restore the power of the stomach, which is usually much impaired in chronic gout.

Fourthly, to treat the local mischief which long-continued inflammation is certain to produce in the articular structures; and

Lastly, to regulate carefully the diet, and pay sufficient attention to other regimenal means.

CHAPTER XIII.

TREATMENT OF GOUT:—MINERAL WATERS—GENERAL REMARKS ON THEIR EMPLOYMENT—ALKALINE WATERS OF VICHY—MODE OF ACTION OF—AUTHOR'S EXPERIENCE OF THEIR VALUE—SALINE WATERS OF WIESBADEN—THEIR VALUE IN GOUT—SULPHURETTED SALINE WATERS OF AIX-LA-CHAPELLE—EMPLOYMENT IN GOUTY CASES—LITHIA SPRINGS OF BADEN-BADEN USED IN GOUTY CASES—CARLSBAD WATERS—INFLUENCE OF MINERAL WATERS CONTAINING LITTLE SALINE MATTER, AS OF WILDBAD, TEPLITZ, BUXTON, ETC.—SUMMARY OF THE TREATMENT OF GOUT BY MINERAL WATERS.

FROM the opinion expressed in the preceding pages, of the efficacy of dilute saline solutions in the treatment of chronic gout, it will be no matter of surprise, that the subject of mineral waters should be next discussed. The reputation which many of these waters have acquired, shown by the large number of patients who annually resort to the different springs, will sufficiently justify our devoting some short space to the consideration of some of the most important of them.

All mineral waters possess one action in common, derived from the influence of the water itself, and it is a well established fact, that this agent, when absorbed in large quantities, powerfully stimulates the processes of the animal economy, and increases the various secretions. In less important respects, mineral waters differ considerably from each other; those which

contain iron augment the blood corpuscles and restore the impoverished blood of anæmia; those rich in sulphur in the form of sulphides, have their action especially directed to the skin; when sulphates of soda and magnesia are the preponderating ingredients, the intestinal canal is peculiarly influenced and purging produced; lastly, when the alkaline carbonates form the principal constituents, the reaction of the secretions becomes sensibly affected, and the composition of the blood materially altered.

The mineral waters employed in the treatment of gout differ very considerably; some owe their therapeutic value to the nature of their saline ingredients; others may be looked upon chemically as almost inert, except from the water in their composition; many owe part of their efficacy to elevated temperature.

Among the first class may be reckoned the springs of Vichy, Wiesbaden, Aix-la-Chapelle, and Carlsbad; among the second, those of Wildbad, Teplitz, Gastein, Buxton and Bath. It may be observed that several of these latter springs are situated high above the level of the sea, and probably the pure and bracing air of these localities, the deeper inspiration which it occasions, and the stimulation of the system thereby induced, may give rise to much of the improvement in patients who resort thither for the restoration of their health.

Mineral Springs of Vichy (France).—As Vichy is much resorted to, not only by gouty invalids of

France and many other parts of the Continent, but of England also, and as the waters are imported into this country and artificially prepared here, it is a matter of importance that we should investigate their value in the treatment of gout, and the cases best adapted for their administration; for it will be found that these waters are exceedingly powerful, and, when injudiciously taken, capable of producing very mischievous effects. An elaborate analysis of the waters from the many different sources of Vichy and its environs, will be found in a Table in the Appendix, from which it may be gathered that they resemble each other very closely in composition; that bicarbonate of soda forms their chief ingredient, averaging about forty grains to the imperial pint; and that the other carbonates, although they augment the alkaline property of the waters, are but of secondary importance. The water from the Grande Grille and Hôpital is hot, from the other sources it is cold or nearly so.

Bicarbonate of soda, when thus administered, becomes rapidly absorbed into the blood, exalts its natural alkalinity, and, if long continued, causes a species of solution of the blood, and hence medicines of this class have been called fluidifiers, antiplastics, and deobstruents. MM. Trousseau and Pidoux, in their "Traité de Thérapeutique," assert that they have noticed ill effects resulting from the abuse of alkalies taken in the form both of Vichy and Carlsbad waters. Dr. Petit speaks of their neutralising the

uric acid in the blood, or rendering it soluble by the formation of an urate, but this is evidently an erroneous idea, for we have proved experimentally that urate of soda always exists in the blood. The presence of soda in the system in increased quantities appears to affect especially the function of the liver, and to restore it to a healthy state; this may partly be explained by the fact, that the bile itself is a species of soda salt, consisting essentially of two organic acids, the glyco- and tauro-cholic acids united with soda; and as gout, or at least the diathesis leading to its production, is often closely connected with deranged hepatic function, improvement may be expected when this is ameliorated.

The effect of the Vichy waters on the urine is readily recognizable. M. d'Arcet, who made many observations on this subject, states that one glass, containing about fifteen grains of bicarbonate of soda, when taken in the morning fasting, is not sufficient to render the urine alkaline, although it sensibly diminishes its acid reaction; when two glasses are taken under the same circumstances, the urine quickly becomes alkaline, but remains clear, and that passed during the subsequent eight or nine hours has the same characters, after which time it re-acquires its natural acidity; three or more glasses of Vichy water cause the urine to continue alkaline for twenty-four hours, the transparency of the fluid remaining as in health.

When the Vichy waters are employed in the form

of the bath, redness and slight irritation of the skin is liable to be produced, especially if the waters be not diluted.

We have evidence that saline matters are absorbed by the skin with great facility, from the fact that one bath is usually sufficient to render the urine alkaline, even without the internal exhibition of the waters; this has been stated to be the case by MM. d'Arcet, Chevallier, and Dr. Petit.

When at Vichy I made an observation confirming the truth of this statement, taking a bath for twenty minutes composed of equal parts of Vichy and ordinary water. The urine before entering the bath was strongly acid, but on leaving it, the alkaline reaction was well marked and remained so for more than an hour. This alkalization of the urine has usually been regarded as a decided proof of the absorption of the soda salt by the skin; but it is right to mention that the same effect has been asserted to be produced by an ordinary warm bath, and this has been ascribed to the increased action of the skin, causing an augmented elimination of the natural acid secretion.

Dr. Parkes has collected the observations of numerous experimenters on this point, and from these it would appear that very few saline substances are absorbed by the skin during the use of the bath; it seems likewise that there is almost invariably a very distinct lessening of the acidity of the urine from the use of the bath, even when free nitric acid is contained in it. From these observations Dr. Parkes

is inclined to think that writers in general have been too ready to admit the passage of saline substances through the human skin. I have, however, found distinct evidence of iodine in the urine after the use of a lotion containing the compound tincture of that substance, and have also seen symptoms of iodism produced by the external use of the same tincture. The whole subject deserves much further investigation.

Various mucous membranes, especially that of the bladder, are also influenced, and the mucus from them becomes less tenacious, and often diminished in quantity. The perspiration has likewise been supposed to undergo a change in reaction; the bowels are seldom influenced, unless the waters are improperly administered.

For the first few days when taking the waters, few symptoms are observed, but occasionally patients complain of some weariness of the limbs, weight on the head, and a feeling not unlike a slight approach to intoxication accompanied with a desire for sleep, and sometimes there is an increase in the disease for which the treatment has been adopted. These first phenomena are not considered of any importance, for if the medication be continued, they often disappear and are succeeded by a feeling of increased vigour.

If the same symptoms return after the treatment has been pursued for some time, their significance is much greater, as they indicate a condition of saturation of the whole system, and the amount of the

waters must be at once diminished or discontinued, to be resumed again or not according to circumstances.

Use of Vichy Waters in the treatment of Gout.—In 1840, the French Academy of Medicine caused a report to be drawn up by a commission formed to investigate the subject of Vichy waters in the treatment of gout, and in pursuance of their inquiry, many questions were asked of the late Dr. Petit, then Médecin Inspecteur at Vichy; we shall perhaps place the subject in a clear and simple light by giving a short summary of the report thus elicited.

Dr. Petit considers that the waters may be employed when a fit of gout is impending, and even when it has begun to develop itself, and he thinks that the accompanying fever, if simply dependent on the articular affection, and in no way connected with any disease of the organs of the chest or abdomen, need not be regarded as a contra-indication. However, there are certain patients who are very susceptible, and in whom the tolerance for the waters diminishes or entirely ceases when an attack of acute gout affects the joints; in such cases it is right either greatly to decrease or altogether to suspend the use of the waters. On the decline of the fit it is also necessary to act with much prudence, for fear of reproducing the attack; active treatment should not be recommenced too soon, and it is especially necessary to avoid the early use of the bath.

The results obtained from the waters are much more

prompt, more complete, and consequently more striking, in acute than in chronic gout, when the intervals are short, and when the treatment must be long persevered with, in order to give any hope of patients regaining the use of their joints, and even then the advantage is by no means certain. During a course of treatment in chronic cases, the disease may occasionally assume an acute character, but this is not essential for the success of the cure.

Dr. Petit considers that chalk-stones are occasionally absorbed, although this is a rare occurrence, but he thinks that when patients are submitted to the alkaline treatment, and this is persevered in for a long time, it is rare that new concretions are formed.

The effect of the Vichy treatment is to diminish the violence of the fit, and somewhat abridge its duration, but its chief object is to combat the proximate cause of the disease, and prevent its return.

Dr. Petit remarks that, as a rule, the Vichy waters agree well with the gouty, but he advises moderate doses to be commenced with, as five or six glasses per diem, and the administration of a bath. If these be easily supported, the number of glasses may be increased to twelve or fifteen. Some patients have taken as many as twenty, or even five-and-twenty glasses, without inconvenience, imagining that if relief be obtained from small quantities, much more advantage will accrue from larger, and so the prescribed amount is often exceeded. Certain individuals have been known to drink thirty, forty, and fifty glasses

per diem, and it was affirmed by one gentleman, although the statement can scarcely be credited, that he had taken as many as eighty-four glasses in the twenty-four hours.

Dr. Petit considers that the waters of Vichy owe their efficacy in gout to the fact of their containing much soda, and that other waters similarly constituted would have the same value. He also thinks that as the waters contain the soda in the form of the bicarbonate, they are useful when taken at a distance from their source; but that, as a rule, they do not sit so easily on the stomach and cannot be taken in so large quantities as at the springs.

During the first and second years of treatment, full saturation of the patient is considered of advantage, and for this purpose at least a month's exhibition of the waters is necessary; considerable benefit is often obtained from prolonging the treatment even beyond that time, especially if stiffening or anchylosis of the joints is present.

Patients occasionally experience a repugnance for the waters, accompanied with want of sleep, and a feeling of agitation, and sometimes this is shown at an early period of their exhibition; when it occurs the treatment must be at once discontinued.

Having thus exposed the principal views on the treatment of gout by the use of the Vichy waters held by Dr. Charles Petit, a gentleman who had abundant opportunities of becoming thoroughly versed in the subject, it is only right to observe that his opinions

are not generally received even by French physicians: for example, Dr. Durand Fardel, Inspector of the Sources of Hauterine near Vichy, who has also written on the subject, differs considerably from Dr. Petit on several important points; for, although he is fully of opinion that much benefit is often derived from the use of the Vichy waters in gout, and that if they do not cure the disease, still they exert a salutary influence upon the general health, as well as on the symptoms of the malady, he nevertheless considers that their exhibition demands much caution. Dr. Durand Fardel believes that Vichy waters do not cure gout by specially influencing the uric acid, but merely by producing an alterative effect. As the mineral waters act as general excitants to the whole organisation, and especially to the secreting organs, he thinks they should only be employed under certain circumstances, which may be thus briefly stated.

They should not be taken either when a fit of gout is threatened or at its commencement, or during its continuance, or after its decline, until we are fully assured that it has completely passed off.

The time most favourable for the exhibition of these waters is during complete freedom from the attacks.

There are several cases on record of gouty subjects having died suddenly soon after commencing the Vichy treatment, but these patients were suffering not only from gout but likewise from organic disease of some important organ. Sometimes the disorder

appears to have been rendered more chronic, and sufficient evidence of the occurrence of ill effects has been given to make it advisable to use great caution, not only in the mode of the employment of the waters, but likewise in the selection of the cases.

Having seen cases of gout exhibiting every variety of phase, in which Vichy waters have been employed, and having witnessed the plan of treatment adopted at the baths, I feel entitled to give an opinion upon the subject. Vichy waters are undoubtedly agents which powerfully influence the whole economy, and alter the character of the animal fluids, and, if they are capable of effecting good, they are likewise capable of causing much evil.

With regard to their exhibition in gout, I consider them to be often injurious in chronic cases, especially when the system is already lowered, and the rapid formation of urate deposits is taking place either in the joints or upon the service of the body, I believe that they sometimes increase these deposits, and still further depress the vital powers. I also think that the constitution of Vichy waters is not such as to render them desirable for the majority of gouty cases, inasmuch as an excess of carbonate of soda rather tends to diminish than augment the solubility of urate of soda, which is always present in the blood in these subjects. In many forms of chronic gout the baths are useful, but then their value is independent of any peculiarity in their composition.

In acute gout Vichy water, taken in moderate

quantities, either during the attack, or when a fit is impending, or on its decline, is not likely to do harm, but the use of the bath is very hazardous, and should never be risked; I am confident that when acute inflammation is present, other treatment is more appropriate.

In the complete intervals of acute gout, and more especially in strong and robust subjects, when the disease depends rather on increased formation than defective elimination of uric acid, and likewise in cases in which the liver and digestive functions are considerably at fault, the employment of these waters is likely to prove most beneficial; in other forms of gout mineral waters of a different class may be resorted to with greater advantage than those of Vichy.

Mineral springs of Wiesbaden (*Nassau*). The physical and chemical characters of the Wiesbaden waters may be represented by those of the Kochbrunnen spring, which is the one almost exclusively employed. The water of this spring possesses the following properties. The temperature is about 160° Fahr., and it emits copious vapours; in odour it somewhat resembles quick lime, and the taste is not unlike weak but highly salted chicken broth; its density is 1006·6, and it contains in the 1000 parts, 8 parts of solid matter, and 0·5 parts of gas. The detail of the analysis by M. Fresenius will be seen in the Appendix.

When the water is allowed to remain in contact

with the air, as occurs in the baths, a pellicle forms on the surface, of a somewhat greasy appearance, but, in reality, it consists of carbonate of lime, which the escape of carbonic acid has rendered insoluble, and no appreciable amount of organic matter is present in it.

It will be evident from the consideration of the nature of Wiesbaden waters, that the effects produced by them upon the economy are due, in part to the exhibition of water at a high temperature, in part to the saline matters contained in it, and more especially to the chloride of sodium. The lime salts, as the carbonate and sulphate, probably possess some influence, as also the free carbonic acid and the small amount of iron, but these, as well as the remaining ingredients, play a very secondary part compared with that exerted by the common salt.

The physiological effects usually produced by these waters when taken in small doses are, some increase of the saliva and buccal mucus, giving rise to frequent deglutition and acuteness of the taste; a feeling of warmth in the epigastrium, accompanied with eructation of carbonic acid gas; along with these symptoms there is usually an increase of appetite, and improvement in the digestive functions. After the absorption of the waters into the system, the only appreciable effect is an augmentation of the urinary secretion. The bowels are usually not affected by the waters except they are taken cold, when they sometimes produce a slight action; on the other hand, if the

patient drink them very hot, constipation may be induced.

If the waters be administered in larger doses, all the above symptoms become more marked, and unless the skin and kidneys act very freely, slight diarrhœa is apt to occur, with stools rich in the biliary constituents and other secretions from the intestinal tube.

These large doses if continued for several weeks, generally give rise to a diminution in the weight of the body, and this is more especially seen in the decrease of abdominal fulness; cutaneous eruptions, especially acne, are often developed, and should the waters be persevered in beyond this point, symptoms indicating the saturation of the system with the saline matter appear, indicated by great aversion to the waters, eructations, thirst, furred tongue, and a feeling of prostration, pointing out the propriety of discontinuing the treatment; if persevered in, vomiting and diarrhœa, congestion of the organs of the chest and head, and other very unpleasant symptoms may arise. In still larger doses, the waters prove decidedly purgative.

Dr. Braun, in his work entitled Monographie des Eaux Minérales de Wiesbaden, has given the results of some experiments made for the purpose of ascertaining the effects of these waters on the urine, and these appear to show that a large increase in the elimination of uric acid and urea arises from their exhibition either in the form of bath or when taken internally. If these results, which will be found in

the Appendix, were confirmed by further observation, they would indeed go far to explain the value of the thermal treatment pursued at Wiesbaden.

The action of the Wiesbaden waters in the form of baths have been investigated by Neubauer and Dr. Genth. Neubauer found that upon himself half an hour's bath increased the amount of water, also the urea and uric acid, and, in a slighter degree, the other urinary constituents; it also increased the free acidity of the urine; but, in Dr. Genth's case, the effect was different, as the bathing diminished the urea, and only increased to a very slight degree the uric acid. Neubauer found that drinking the waters increased the urea; Dr. Genth, on the other hand, noticed a decrease both in the urea and uric acid. It must therefore be considered that at present nothing very definite has been made out concerning the physiological effects of the Wiesbaden waters.

The Wiesbaden waters have been strongly recommended in gout, and there are certain forms of the disease in which they may be advantageously administered; they are more especially indicated for subjects in whom the circulation is sluggish and the secretions deficient, also in cases in which there is much stiffness of the joints from previous attacks. It is not uncommon for an acute attack of the disorder to supervene after the waters have been taken for a short time, and when this happens they must be discontinued. When there is much debility, the Wiesbaden treatment should not be attempted, and great care is

necessary with regard to the use of the baths if there be any symptoms indicating disease of the organs of the chest, or of much injury of the kidneys. I have had the opportunity of watching the effects of the Wiesbaden waters upon numerous gouty subjects, but cannot say that they have often been productive of much benefit, as they have not appeared to diminish the frequency of the attacks nor to cause them to become less severe; it must in fairness be added, that patients seldom resort to Wiesbaden from this country till their gout has become both chronic and intractable.

Did the waters possess the properties ascribed to them by Dr. Braun, they certainly should not bring on an acute accession, for the blood would be at once rendered too pure for the occurrence of the gouty fit to be possible. I believe the waters are more adapted to the treatment of chronic forms of rheumatism; at the same time I have little doubt that their proper exhibition in many cases of true gout may be attended with advantage.

Dr. Robertson informs me that, after seven years' experience at Wiesbaden, he has come to the conclusion that the Wiesbaden waters have no very specific action in true gout, but are more advantageous in chronic forms of rheumatism; in gout they are useful if it be desirable to bring on an attack, which they often do. Dr. R. also remarked that when baths were taken the patients became much more quickly influenced, if the temperature was under that

of the body, but that most patients took them too warm.

Mineral Springs of Aix-la-Chapelle (Rhenish Prussia).—The waters of Aix-la-Chapelle are characterised by their peculiar odour, and many of the springs have also a high temperature; although apparently differing from the mineral waters we have hitherto considered, more minute examination shows that the difference is by no means so marked as might be at first anticipated. The principal spring is the Emperor's (Kaiserquelle), the water of which is clear, smelling strongly of sulphuretted hydrogen, temperature 135° Fahr., and sixteen ounces contain about thirty-two grains of saline matter and twenty-six cubic inches of gas.

The analysis in the Appendix shows that the water is saline and alkaline from chloride of sodium and carbonate of soda, and that the odour is due to the presence of a minute quantity of sulphuretted hydrogen and a small amount of sulphide of sodium.

The therapeutic effect of this water is similar, but less potent than that of Wiesbaden, in addition to which the sulphur it contains produces a marked influence over the cutaneous function. It is, therefore, indicated for gouty subjects in whom the skin is more than usually harsh and dry, and likewise in cases where a general feebleness of habit exists, combined with much rigidity of the joints; at the same time it must be remembered that the compo-

sition of the water offers nothing peculiarly fitted to combat the gouty diathesis, except that it contains a small amount of alkali in the form of carbonate of soda.

Mineral Springs of Baden-Baden.—As yet I have had no experience of the value of these waters in the treatment of gout, but as their powers in modifying this malady have been recently tested by Dr. Ruef, and as lithia has been found to be an important element in their composition, I cannot do better than introduce in this place a portion of a short article which has been recently inserted in one of the medical journals by Dr. Althaus.

"A very large quantity of lithia was found in two of the thermal springs of Baden-Baden, namely, the Fettquelle and the Murquelle, of which the former contains 0·2315 grains of chloride of lithium in sixteen ounces of water, and the latter 2·3649 grains of it. In one hundred pounds of the salt extracted from the Murquelle nine and three-quarter pounds of lithia are contained; that is, a quantity of this substance worth 90*l.* sterling. This amount is not equalled by that contained in any other mineral spring which has yet been examined.

"In consequence of the analysis of these springs, made by Professor Bunsen, they have, during the last season, for the first time been extensively used in cases of gout and lithiasis; and I am indebted to my friend Dr. Ruef, of Baden-Baden, who has treated a

large number of cases of that description with them, for the following particulars regarding the result of their administration.

"The physiological effects observed after taking the waters are as follows:—At first it promotes digestion, and a feeling of well-being is induced; but after they have been taken for some time, and especially in large doses, sickness, disposition to vomiting, and diarrhœa ensue, which in most cases, however, gradually disappear, but sometimes continue as long as the water is drunk. A constant effect is an increased elimination of urine, the quantity of which is often doubled, or even trebled; it becomes turbid after some time, and large quantities of a reddish sediment are deposited in it. In some of the patients treated by Dr. Ruef, profuse perspiration came on after from five to ten days, and continued as long as the water was drunk; and in the case of a lady who had not freely perspired for years, this perspiration even continued two months after the cure had been finished. It therefore appears that the water is a diuretic as well as a diaphoretic.

"Concerning its therapeutic action; in almost all cases the pain in the joints is increased at first (especially in those patients who were in the end cured) to a rather high degree, but it never spread to healthy parts. In joints which were perfectly contracted, crackling, dragging, and pulling were felt, as if the articulations were being torn asunder; but after such an attack of pain, a sensation of easiness and decided

improvement was felt, and the mobility of the limb was much increased. In one patient, a physician from Epernay, a regular fit of gout came on during the use of the water, under the continued use of which this patient so rapidly improved, that he could walk about again after three days.

" Gouty affections of the joints, of the sheaths of the nerves and the muscles, if not of very long standing, were cured after three or four weeks, and have remained so up to the present moment. In periodically recurring headache on one side, which is often due to gout, the effects were also very beneficial. A lady who had been contracted for fourteen years, and who could neither stand, nor walk, nor carry a spoon to the mouth, was by the use of this water so much improved that she was able to walk a little, and to stand and eat by herself, while no former medication had relieved her. This patient also suffered from dysmenorrhœa, the most prominent symptoms of which were severe abdominal pain, oppression and asthma, cold and paralysis of the left arm. She had only taken the lithia water for eight days when the catamenia appeared, and were unaccompanied by any unpleasant symptoms whatever; nor did these latter reappear afterwards. In a male patient whose finger-joints were infiltrated with urate of soda, which was visible in white specks through the skin, these infiltrations were removed, and the swelling diminished.

" The mode of administering the water was as follows:—For patients with whom large quantities of

water do not agree, five grains of the carbonate of lithia were added to a bottle of the water of Murquelle, which contains five grains of chloride of lithia; and the water was then impregnated with carbonic acid, in order to render the carbonate more soluble. Of this water a tumblerful was drunk three times a day; and if an increase of the dose appeared necessary, two or three grains of the carbonate were added to every glass. If patients are able to keep much water on their stomach, they may take six or eight tumblersful of the Murquelle, without any artificial addition of carbonate of lithia. Baths with water of the same spring were also given; and the Administration of the Spas of Baden-Baden are now occupied in preparing a mother-lye from the water of the Murquelle, in order to gain so much of the salt that it may next year be added to the baths. Of all the antarthritic remedies offered by the springs of Baden-Baden, none have proved so beneficial as this lithia spring. Dr. Ruef has, in some cases, at the same time employed the Russian vapour-baths, prepared from the steam of the hottest spring of the place, which has a temperature of 155° F."—*Medical Times and Gazette.*

Waters of Carlsbad (Bohemia).—A reference to the analysis in Appendix will show that sulphate of soda is the principal ingredient of Carlsbad waters, but carbonate of soda and chloride of sodium are important constituents, in addition to which the high temperature adds powerfully to their therapeutic influence.

In the majority of patients a purgative action is induced by the exhibition of these waters, usually followed by copious diuresis, and some excitement of the vascular system. Owing to the presence of the carbonate of soda, these waters possess the power of rendering the fluids more alkaline, and thus, in some respects, resemble those of Vichy.

The waters of Carlsbad are employed with most advantage in gout connected with fulness of habit, combined with derangement of the liver and deficient secretions from the alimentary canal; in cases, therefore, in which the disease is more especially due to the excessive formation of uric acid: in weak habits, or when the kidneys are seriously implicated, they should not be resorted to, as they may then be productive of serious mischief, from the powerful disturbance they cause in the whole system.

In the same category of mineral springs may be mentioned those of Kissingen, Marienbad, Homburgh, Ems, Soden, and Cheltenham: all of them contain a considerable amount of saline matter suitable to particular forms of gout, and some, particularly Ems, are likewise alkaline, from the presence of a little carbonate of soda.

The second class of mineral waters embraces those which owe their therapeutic powers more especially to the influence of the water itself, often increased by its high temperature. The more important are those of Teplitz, Wildbad, Buxton, Gastein,

and Bath. The analyses of the first three waters will be seen in the Appendix, and may be taken as types of the whole class. The mineral constituents are insignificant, and can add but little to the therapeutic properties of the water itself; as regards the Buxton waters, an attempt has been made to refer their action to the large amount of contained nitrogen, but, to say the least, the explanation is very problematical. These waters are more especially used in the form of the bath, or douche, but many of them are advantageously employed as internal remedies.

A very large portion of the visitors at Teplitz labour under some form of gout, and it is asserted that much benefit is derived from the administration of the waters.

The Teplitz springs are most suitable in gout attended with debility, and the baths are especially indicated when the stomach is unable to bear a large quantity of liquid; long immersion in a water of low specific gravity, and one containing but little solid matter dissolved in it, is favourable to endosmosis, and hence considerable absorption ensues. As the solid ingredients consist chiefly of carbonates of soda and lime, with traces of iron, a slight increase of alkalinity is given to the animal fluids, as likewise some stimulant action to the secreting functions—effects which equally result, whether these waters are administered in the form of the bath, or taken internally.

The remarks made on the Teplitz waters apply to many others, more especially to those of Wildbad,

Gastein, Bath, and Buxton, which contain but a trifling amount of mineral ingredients. With regard to the efficacy of Bath waters, Heberden made the remark, that he had not been able to see any good result from their external use, either when gout was present or in the intervals; on the contrary, he thought they appeared rather to increase the weakness of the limbs.

In certain forms of gout, especially after a course at any other spring, the ferruginous waters are of considerable value, and of these the most important are Spa, Schwalbach, Pyrmont, on the Continent, and in this country, Tunbridge Wells.

From what has been now advanced concerning the nature and action of the several mineral springs which have acquired reputation in the treatment of the different forms of gout, it is evident that much caution is necessary to prevent the occurrence of mischievous consequences, and considerable judgment demanded to ensure success.

The rules I now subjoin will safely guide the practitioner either in advising or in proscribing the exhibition of mineral waters in gouty cases.

They should be altogether prohibited when there is considerable structural disease in any important organ, especially in the heart or kidneys; and even when the organic mischief is slight, the greatest caution is necessary in their use.

They should be avoided when an acute attack is either present or threatening.

The waters should be selected according to the nature of the case. When the patient is robust, and of full habit, the alkaline saline springs; when torpidity of the bowels predominates, the purgative waters; when there is a want of vascular action, the saline waters; when the skin is inactive, the sulphur springs; lastly, when debility prevails, then the more simple thermal waters should be chosen.

In all cases the use of the waters should be cautiously commenced with, and care taken not to oppress the stomach by giving too much liquid, nor to induce debility or any other injurious effects by allowing a too long sojourn in the bath.

In conclusion I may add, that we should not expect too much from the exhibition of mineral waters, as their influence, even when most advantageous, endures but for a short time, whereas the causes of the disease are, in many cases, in constant operation.

CHAPTER XIV.

IRREGULAR FORMS OF GOUT:—PRELIMINARY OBSERVATIONS—DIFFICULTIES IN THE INVESTIGATION OF IRREGULAR FORMS OF GOUT—MODE OF ASCERTAINING THE TRUE NATURE OF DIFFICULT AND ANOMALOUS CASES—RETROCEDENT OR METASTATIC GOUT—IMPLICATING THE STOMACH, HEART, AND HEAD—GOUT AFFECTING THE DIGESTIVE ORGANS—THE HEART—THE RESPIRATORY ORGANS—URINARY ORGANS—THE EYE—THE EAR—THE SKIN—THE NERVOUS AND MUSCULAR SYSTEMS—TREATMENT OF THE DIFFERENT FORMS OF IRREGULAR GOUT.

WE now approach a subject beset with difficulties, and one which requires the most careful exercise of the judgment in order to arrive at results satisfactory to the pathologist. That there are irregular forms of gout must be conceded by all who have turned their attention to the study of this disease, and daily experience confirms the concession. It is not uncommon to find a patient with symptoms which may be properly classed under this head, long before the advent of a fit of gout, and although such symptoms may disappear on the occurrence of the paroxysm, yet they occasionally continue, in a mitigated form, during the progress of the articular inflammation, and are often present during the intervals; now and then, indeed, they occur in subjects who have never experienced a true fit, but who probably either inherit gout, or

at least have been much exposed to its predisposing causes.

When at any time we can demonstrate that the symptoms depend upon the same diathesis as leads to the inflammation of the joints, we are certainly justified in considering them as irregular manifestations of gout. The difficulties in distinguishing the true nature of such anomalous symptoms are many; for we must remember that these patients may be affected with both functional and organic diseases, not necessarily gouty; for example, pleurisy may occur from exposure to cold, bronchitis from a similar cause, and although the course of such diseases may to some extent be influenced by the condition of the system, yet such complications can scarcely be denominated gouty: that this has been commonly done there is little doubt, and thus have arisen the numerous forms of irregular gout described by many of the older writers in this country and on the Continent.

Many of the more powerful predisposing causes of gout tend to produce other diseases, but when these latter occur, they are not necessarily of a gouty character; such causes, for example, will not unfrequently lead to cardiac diseases, as chronic valvular alterations, atheroma, and hypertrophy, and I have ascertained, by post-mortem examination, that even when such changes occur in subjects who have long been afflicted with gout, they have not the same composition or structure as those essentially connected with this disease; examples illustrating this point will

be found in the Chapters on pathological anatomy. The long-continued existence of chronic gout often leads to a depraved condition of the general nutrition of the body, and the slow production of many organic diseases, a circumstance which must not be lost sight of in the inquiry.

From a careful examination of many recorded cases of anomalous gout, I am of opinion, that by far the majority have no real claim to be so considered; some are in no way related to the disease, and others only so far as they occur in gouty conditions of the habit.

There can be no question that the same disposition which ordinarily leads to the development of regular gout, may produce symptoms altogether apart from the joints, but still essentially of a gouty character: we shall now direct our attention to the investigation of such affections, remembering that it is of the highest importance to the advancement of medical science, that we should not use the latitude which the term irregular gout affords us as a cloak for our ignorance of the nature of any disease, but apply the name only to such instances as we can clearly demonstrate to depend directly on a gouty state of the system.

Irregular forms of gout have received various names, as *anomalous gout*, *non-articular gout;* and by the French certain varieties have been named *goutte larvée*, *goutte vague*, *podagra larvata;* at times the term *misplaced gout* is employed; but some writers include all these different affections under the head of

atonic gout, as they are commonly met with in a condition of the system characterised by want of tone.

Upon examining a case suspected to be one of irregular gout, we should investigate the history, in order to find if there be any hereditary predisposition to the disease, and to what degree this exists; and also to discover if the predisposing causes of gout have been operative. The age and sex of the patient should likewise have due weight in the inquiry.

It should be ascertained whether there has been any joint affection, and, if so, the peculiarities which it exhibited; it is also important to ascertain if the symptoms, supposed to depend on the gouty state of habit, are influenced by causes known to affect, in a marked degree, true gout.

If there be much doubt as to the nature of the case, it may occasionally be desirable to examine the condition of the blood, by which means a clue may be obtained, for, as we have proved that gout is invariably attended with impure blood from the presence of uric acid, it follows that when, in anomalous cases, the blood is not so altered, the symptoms cannot depend on a gouty diathesis; if, on the contrary, the blood exhibit such impurity, it is a matter of high probability that the phenomena are so connected. I say, probability rather than certainty, inasmuch as uric acid occasionally exists in the blood without the production of any characteristic symptoms.

In order to reduce the phenomena of anomalous gout to a scientific precision worthy of the present

age, the above considerations must not be lost sight of; for if the facts advanced in the preceding chapters be correct—and that they are so satisfactory evidence has been adduced—I have no hesitation in affirming that what has now been stated with regard to the blood in cases of irregular gout must be so also.

There is generally some little difficulty in these cases in determining the presence of uric acid in the blood, as venesection is seldom absolutely requisite, and there is a natural repugnance to its performance, although but a single ounce be required. In such instances, I have occasionally had recourse to a blister, the application of which is sometimes advisable as a therapeutic agent, and can never be productive of injury; it must be confessed, however, that the examination of the serum from a blister is not so satisfactory as of that from blood, although, when positive evidence of the presence of uric acid is afforded by it, the results are equally conclusive.

In treating of irregular gout I shall first speak of that form denominated retrocedent or metastatic, and then proceed to describe the other varieties according as they affect different organs or tissues of the body.

Retrocedent Gout.—Gout is named retrocedent when a sudden disappearance of the articular affection is followed by serious mischief in some internal viscus, as if a metastasis or change of position had taken

place: the organs usually attacked are the stomach, the heart, or brain. That such a metastasis of gouty inflammation occasionally occurs is undoubted, but it is no less true that in the majority of the recorded instances considerable mischief had previously existed in some important organ, which proved the immediate cause of the so-called metastatic action. To separate the true from spurious cases is a task of much difficulty.

When the *stomach* is attacked, the symptoms indicating the transference of gout are an intense feeling of oppression and anxiety, often accompanied with spasm, pain, and vomiting. Coste relates the case of a soldier who caused the gouty inflammation to subside by the application of spirits of camphor to the joints, and was immediately seized with cold sweats, and vomiting of a green-coloured bile. Sydenham appears to have suffered from similar symptoms on the retrocession of gout from his limbs.

Sir C. Scudamore relates two cases of this form of disease, of which the following are short abstracts:—

Case 1.—A corpulent man, aged 47, had suffered from gout for twenty-five years, and had been treated with large doses of the eau medicinale, which much depressed him; and had also left off wine, in which he formerly indulged. Having one day been exposed to cold and damp, when suffering from gouty symptoms in his feet, although he felt no inconvenience at the time, yet on the following night he was suddenly

seized with excruciating pain in the stomach, and such an oppression from flatus that he thought his stomach would actually burst: hot fomentations, ether, opium, and brandy-and-water relieved the alarming symptoms, which were followed by a severe paroxysm of gout in the knees and feet.

On another occasion this gentleman, from exposure to cold, had a return of symptoms, though of a different character; a kind of torpor came over him, the pulse was slow and languid, the skin cold, features collapsed, and breathing laboured, and both speaking and deglutition were difficult; stimulants were again successful in giving relief.

Case 2.—A gentleman, aged 52, had his first attack of gout when 31 years old, affecting one of his feet. When still suffering from gouty symptoms, and after having eaten heartily, and drunk madeira-and-water, he was exposed to the cold air. Suddenly there occurred an alarming oppression of breathing, cold perspiration, and a sensation of burning rising up from the bowels, but no pain; also nausea, and a feeling of sinking, so as to cause an apprehension of fatal syncope; there was also palpitation of the heart. After drinking warm water, so as to produce vomiting, a large amount of acid matter was ejected from the stomach, with immediate relief. At the time these symptoms were urgent the foot became easy, but on their abatement there was a return of acute gout in that part. This patient had a subsequent attack of retrocedent gout of a similar character.

The exact pathology of retrocedent gout, when it attacks the stomach, is difficult to determine. Is it ever inflammatory? or does it simply consist in violent spasm of the muscular coats of the organ? The cases which have hitherto been recorded do not suffice to settle the point, but the remedies which relieve would appear to show that it is functional. The application of cold is perhaps the most common cause of retrocession of gout to the stomach, especially when accompanied with a heavy or indigestible meal.

Dr. Home relates the case of a gentleman who exposed himself to wet and cold when suffering from slight inflammation in his feet, and the same afternoon enteritis followed, which in twelve hours proved fatal.

This last case, as well as many others on record, can scarcely be considered as an example of retrocedent gout, for exposure to wet and cold will give rise to inflammation of internal organs, independent of the gouty diathesis, and it is extremely probable that when a patient is suffering from articular gout, the system is rendered very susceptible to the influence of those causes, and consequently a less amount of exposure may produce serious mischief. It is difficult to conceive that if the internal inflammation is simply of a gouty character, it would lead to serious consequences, seeing that when gout attacks the joints, the injury caused is by no means so great as that induced by other forms of inflammation.

I cannot say that I have ever witnessed a case to which I should feel inclined to apply the name of retrocedent gout of the stomach, although I have often seen symptoms arise in gouty patients which might probably be so designated by many physicians. The instances which have come under my observation have always been explainable by other means, and, as Dr. Watson justly remarks, the so-called *gout* in the stomach has sometimes turned out to be *pork* in the stomach.

Without denying the possibility of acute gouty inflammation attacking this important organ, I am inclined, until further evidence has been adduced, to doubt its occurrence, and to regard the so-called instances as either dependent on ordinary gastritis occurring in gouty habits, or as forms of acute dyspepsia, to which such subjects are peculiarly liable, depending on sudden loss of power in the stomach, accompanied by spasm and flatus. Shocks to the nervous system, as powerful mental emotion occurring shortly after meals, are often productive of gastric symptoms, and it may be that the sudden repression of articular inflammation is capable of influencing the nervous system in a similar manner. Hunter was inclined to regard the effect of gout on the stomach and bowels as altogether dissimilar to that upon the extremities; but Sir C. Scudamore thought that the established opinion of an occasional transference of inflammatory action from external to internal parts, in cases of gout, had been clearly made out, and that

it was important in practice as well as admissibl
doctrine.

When the *heart* is seized with retrocedent
there is usually a feeling of constriction about
chest, violent palpitation, intense anxiety, difficul
breathing, accompanied by a very small thr
pulse, and other signs of syncope. A well-ma
instance of this form of retrocedent gout is relate
Dr. Alexander in a gentleman, who, when suffe
from a severe attack of gout, very imprudently ap
snow to the painful foot, which produced at
great relief from the pain, but was soon followed
sensation of burning and constriction at the l
part of his chest, as if a red-hot iron wire had
placed round him, and that it was being pu
tighter and tighter; after this he could remem
nothing; he was found sitting in his chair, with
usual florid complexion changed to a death-like pa
respiration exceedingly slow and snatching, pulse
and almost imperceptible. He was restored by
aid of stimulants and counter-irritants. It
evident that in this instance the cold applica
produced powerful spasm of the heart, leadin
extremely defective action.

Whether the heart is ever attacked with g
inflammation is still a matter of doubt, for the evid
in support of its occurrence is by no means conclu
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and probably, in most of the cases of retrocedent
which have proved fatal, some cardiac mischie

valvular disease, dilatation, or fatty degeneration, had existed previously.

When retrocedent gout attacks the *head*, apoplexy is commonly induced, but maniacal symptoms occasionally arise. When the apoplexy has terminated fatally, serous effusion has been found in the brain; such occurrence has usually arisen from the application of cold to a gouty limb, as by plunging it into cold water. That gouty inflammation should implicate the fibrous membranes of the brain, as the dura mater, might be expected, but it seems probable that in many of the cases in which apoplexy has supervened, the brain was previously in a state of ramollissement, or otherwise diseased. I believe no demonstration has ever been afforded of the presence of true gouty deposits in these structures.

Dr. Copland relates an instance which came under his notice, of a medical man who experienced symptoms of gout in several organs within the space of a few hours; he had had an imperfect attack in the foot, and on its forsaking this situation, the bowels became affected with violent colic, then the diaphragm and lungs, causing the most urgent dyspnœa, and lastly the head was implicated in a slight degree; after this the disease again appeared in one foot, and subsequently in the other.

Having given a slight sketch of those sudden, severe, and obscure attacks to which gouty patients are occasionally subject, and to which the term retrocedent gout has been applied, I shall now endeavour

to lay before the reader some account of the disease when it implicates organs and structures other than those of the joints, or when it assumes the character of ab-articular gout.

Gouty affections referable to the Digestive Organs.— Symptoms mainly referable to the digestive organs have already been described as being frequently premonitory of an attack of gout, but it is not uncommon to find severe and protracted dyspepsia in patients who have never suffered from a fit, but who either inherit the disease very strongly, or who have sown the seeds of it by their mode of living; in such cases the derangement of the digestive organs is doubtless often dependent on an impure state of the blood, arising from the presence of urate of soda. It is often a matter of considerable difficulty to make a correct diagnosis in these instances, but at times this difficulty is at once removed by the sudden supervention of a true fit of articular gout, and the equally rapid disappearance of the gastric disturbance. Such relief, however, is not always experienced, and patients may suffer for months and even years without the nature of their ailment being discovered, and this occurs more especially in persons who have led a very temperate life, but who are strongly predisposed to the disease: slight threatenings, however, of the toe affection are sometimes, on enquiry, admitted to have been felt, sufficient to render the pressure of the boot uncomfortable.

Besides the symptoms already described as premonitory of a fit, other gastric phenomena are occasionally met with, as gastrodynia, pyrosis, and enterodynia.

A gouty state of habit is often accompanied by constipation, but sometimes diarrhœa ensues, and I have known several individuals who appeared to escape fits of articular gout by the frequency of such evacuation from the bowels.

The gastric disturbance which precedes acute gout usually becomes increased in the chronic form of the disease; to such an extent indeed, that the patient may be tormented in the intervals of freedom from the joint affection, and unable to bear the slightest irregularity of diet; this form of dyspepsia probably depends on the augmented impurity of the blood arising from the impaired state of the kidneys; it is likewise a prominent feature in disorders directly connected with a granular state of these organs.

I have met with one instance in which the œsophagus was distinctly affected, so as to cause the greatest difficulty in swallowing, which symptom was at once relieved by the occurrence of articular gout: cases are related in which the rectum has been constricted from the same cause; and it should be mentioned that hemorrhoids frequently occur in gouty patients, and are due to the congested state of the portal system.

The following examples are illustrative of this form of gout, and are selected from among numerous similar cases which have come under my care :—

Case 1.—A gentleman, aged 64, whose general health had usually been good, came under my care with the following symptoms. For the last two years he had suffered from pyrosis and attacks of violent retching, but with little vomiting, occasionally however he had noticed a streak of blood. He had lost flesh but was not emaciated. The sickness occurred chiefly in the morning, and about two or three times in the fortnight. He was troubled with frequent and severe cramp. Upon enquiry, I found that this patient had for more than twenty years been subject to periodic attacks of gout, generally in the spring of the year, and affecting the great toes and knees; but during the time the dyspeptic symptoms had been present, scarcely any symptoms of articular gout had been manifested, or merely twinges in one of the toes. Thinking it probable that the stomach affection was closely connected with a gouty state of the system, I prescribed with that object, and had very soon the satisfaction of finding the disease rapidly give way, and the patient in a little time completely restored to health.

Case 2.—A gentleman, about 40 years of age, who had for some time lived freely, was suddenly attacked with violent pain in the stomach, accompanied with intense depression of spirits; after a few days these symptoms were suddenly relieved by the occurrence, during the night, of a sharp fit of articular gout affecting first one then the other great toe. This was

the first time he experienced any attack of the disease.

Case 3.—A gentleman, 53 years of age, of somewhat spare habit, inheriting gout from his paternal grandfather, first experienced some pain in the great toes about ten years since; three or four years afterwards, had an affection of the right shoulder, which passed off without treatment. About a year and half since suffered from a very severe attack of gastralgia, apparently caused by mental anxiety; this was accompanied with some jaundice, but not followed by any joint affection. About a fortnight ago he experienced a second attack of gastralgia, very acute; this suddenly ceased on the occurrence of sharp inflammation of the left knee, which is now painful and causing him to walk lame.

Case 4.—A gentleman, about 69 years of age, who had had slight attacks of gout for fifteen years, experienced the following symptoms. During the time that he was suffering from the disease in one foot, he suddenly felt extreme pain in the epigastrium, accompanied with vomiting; the pain in the foot suddenly left him, and remained away till the gastric disturbance had become relieved, it then returned in some degree.

Gout affecting the Heart.—One of the more common symptoms produced by a gouty state of the system is

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deposits upon the aorta are of a
character, consisting either of phospha
of lime or of cholesterine and fatt
Stokes has observed, that when death

or at least an irritable condition of the aorta, is also occasionally produced by gout, and in some instances has caused a suspicion of the existence of aneurism.

Respiratory organs.—Cough and an asthmatic condition of breathing are frequently produced by a gouty state of system. A gouty cough is recognised by all practitioners, and often precedes and accompanies the regular forms of gout; occasionally dyspnœa of a very severe character, and to such an extent as to cause alarm, is connected with the presence of latent gout. A patient was once under my care, having, it is true, some slight emphysema, but suffering from great dyspnœa, so as to be unable to lie down, and was also much distressed by a hard dry cough; the usual treatment, by dry cupping, counter-irritation, and expectorants, was adopted, but with little or no relief; after a few days, the chest symptoms suddenly vanished and gout occurred, first in the ball of the left great toe, and afterwards in the knee. Many cases of a similar nature have come under my observation, and others are on record, all of which clearly point out that the respiratory organs are sometimes affected by gout.

The pleuræ may be occasionally implicated, and a species of dry pleurisy produced; the diaphragm may be attacked, and violent spasmodic cough induced; asthma has also been noticed to be common in gouty families, and is probably due to the presence of an impure state of the blood.

I cannot help thinking, as the result of much experience, that in almost all the cases in which the respiratory organs are thus affected, there is likewise present some structural mischief; often, it is true, very slight, but sufficient to determine gouty action to these parts.

Gouty affections of the Urinary Organs.—It is not uncommon to find gouty patients complaining of much irritability of the bladder, sometimes accompanied with an increased discharge of mucus, and generally with scanty and high-coloured urine, giving rise to a copious urate deposit on cooling. Such symptoms often occur in the intervals of gout, sometimes in subjects in whom regular gout has never developed itself. Sir C. Scudamore relates cases of the former kind in which there was a purulent discharge, relieved by the occurrence of gout in the feet; but from the description of the articular affections in some of these instances, I should be inclined to question their strictly gouty character, and should ascribe the discharge to other causes. A few years since I was consulted on the case of a gentleman who was suffering from the following symptoms: great irritability of the bladder, shown by constant desire to pass water, and inability to sit still for many minutes; urine very scanty and thick from a pale deposit of urate of soda, closely resembling pus; pains in the hips and much palpitation of the heart; so marked were the symptoms that the presence of a stone in the bladder had been suspected by his medical attendant. From the history

of the case it appeared that during the last year the patient's habits of life had been considerably changed; instead of taking much exercise and living plainly, he had led a comparatively inactive life and lived freely. From these circumstances, I was induced to suspect that the symptoms depended on a gouty habit, and treatment given with a view to correct such soon proved completely successful. Dr. Todd relates a case of cystitis apparently connected with the presence of gout, and many other instances in which the bladder has been involved are on record.

The kidneys appear occasionally to be attacked with gout, and when this takes place there is pain in the back and other symptoms found in nephritic forms of disease. From what has been stated in this work with regard to the altered structure which these organs exhibit in the majority of cases of chronic gout, it is not a matter of surprise to find indications of its existence during life. My own observations lead me to think that true gouty inflammation is often set up in the structure of the kidney, accompanied with deposits of urate of soda, not merely in the interior of the tubuli uriniferi but in the fibrous tissue itself. It may be that this structure, from the circumstances in which it is placed, being in constant contact with a fluid having an acid reaction, is selected as the early seat of gouty deposition; that it is frequently so chosen, proof has been afforded in the fact that white points of urate of soda were observed, with few exceptions, in the *post mortem* examination of these organs.

Although the ball of the great toe is apparently selected by gout in the majority of instances for its first invasion, it is quite possible to conceive that the fibrous structures of the kidneys may occasionally take the precedence though not recognisable by any subjective phenomena; this is sometimes the case with the heart in acute rheumatism. In many cases of articular gout I have known the urine to be albuminous for a time, but afterwards to be quite free from this principle; in some of these instances, the albumen may have been due to the temporary presence of gouty inflammation in the renal organs. In a few patients I have found that severe pains in the back, inexplicable by the presence of nephritic calculi, have preceded the development of gout in the joints, and have been speedily relieved by its occurrence.

Instances are on record in which the prostate gland and testicles have appeared to be affected with gouty inflammation and spasm, and the symptoms to have been suddenly relieved on the occurrence of gout of the extremities; but I suspect that in most of these cases other mischief has been present, and the symptoms were only modified by the existence of the gouty diathesis.

Gout of the Eye and Ear.—A form of ophthalmia connected with gout has long been recognised, and appears to be tolerably well established, but as rheumatic inflammation of the eyes is equally allowed to exist, difficulties may at once arise in the diagnosis.

I have witnessed many cases in which conjunctivitis and sclerotitis appeared to be distinctly connected with the gouty diathesis, and instances are recorded of the alternation of ophthalmia with inflammation of the joints. Gouty iritis is also said to occur.

Our information on this subject may be thus summed up. Patients having a well marked gouty diathesis, now and then experience attacks of inflammation of the different structures of the eye; and it is important to bear in mind the fact that the state of the habit may considerably modify and keep up such affections, and also that treatment directed to the morbid condition of the system may prove very effectual in curing the local mischief.

Frequent reference has been made to the presence of little nodules of urate of soda upon the cartilages of the ear, and it has also been noticed that patients occasionally experience pains in the ears prior to an ordinary fit of gout. Dr. Graves, without mentioning the appearance of these small chalk-stones, refers to the twinges in the ears, but attributes them to momentary congestion, and alludes to a gentleman whose ear was sometimes so attacked with agonising pain, but which never lasted more than a few hours. Dr. Graves himself also suffered from similar attacks, which disappeared on the occurrence of gout in the fingers.

When deposition of urate of soda takes place in the fibro-cartilage of the ear, but little disturbance ensues compared with what results from the presence of the

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if cutaneous diseases ever occur in direct dependence upon a gouty state of the system, and it will be found in the sequel that there is much evidence in favour of the idea.

Dr. Graves, in his Clinical Lectures, mentions that he has met with a singular affection in connection with gout, and quotes the case of an elderly lady of decided gouty habit, who was liable to a daily paroxysm of the following character. About three o'clock in the afternoon, her nose became hot, and the heat continued for four or five hours, the skin becoming first of a bright red then of a purplish colour; this redness spread to the upper part of her cheeks, and was accompanied by uneasiness but no pain, and always subsided about the same hour in the evening. Sir Henry Holland asserts that he has so often seen psoriasis prevailing in gouty families—sometimes alternating with acute attacks of the disease, sometimes suspended by them, sometimes seeming to prevent them in individuals thus disposed—that it is difficult not to assign the same morbid cause to these results, however unintelligible its mode of action under such different forms. Several instances of skin disease in connection with gout have come under my own observation, some were cases of prurigo, chiefly in females shortly after the cessation of the catamenia, others of chronic eczema and psoriasis, which have either alternated with or accompanied regular articular gout. Pruritus ani is also a symptom frequently met with in gouty subjects. A case of severe eczema ap-

pearing to depend on a gouty state of the system has come under my notice.

A gentleman having experienced several attacks of gout within a short period of time was put under treatment, and by this means the articular disease was quite subdued; but after a few months an eruption of eczema began to show itself, first on the ears, then one elbow, afterwards spreading to the side of the face and other parts of the body: the eruption appeared to be made worse by the arsenical solution, but to yield to a treatment adapted to the cure of gouty inflammation.

Gout affecting the Nervous and Muscular Systems.—During the progress of regular gout, more especially the chronic varieties, and sometimes without the previous development of the articular disorder, symptoms indicating irritation of the nervous and muscular systems, and clearly referable to the presence of a gouty diathesis, are exhibited. These manifestations are generally of a functional character, but are sometimes dependent on inflammatory action which appears, as far as can be ascertained, to be of the same nature as true gouty inflammation.

Cramp.—We have already had occasion to notice cramp as a frequent premonitory symptom of a fit of gout, and it is one to which gouty subjects are very liable, not only during an attack, but likewise in the intervals of the paroxysms; and in certain cases this

symptom is increased to such an extent as to become a source of serious annoyance.

Somewhat allied to cramp is a peculiar affection noticed in certain gouty subjects by Dr. Graves, consisting in an insuperable inclination on the part of the patient to grind his teeth; this desire appears to originate in a disagreeable uneasy sensation in the teeth themselves, and is for the moment alleviated by forcibly grinding them together, but immediately returns when the patient ceases to perform this action, and is therefore continued during the entire day when the disease is confirmed. When asleep, the patient no longer grinds his teeth, the grinding being in all cases the result of voluntary motion. Dr. Graves gives details of four persons so affected, and remarks that as this grinding continues for years, it produces great changes in those organs, affecting sometimes one side of the jaw, sometimes both; so that in confirmed cases, the teeth are ground down to the level of the gums. Having witnessed many instances of this kind and all of them in persons of the gouty diathesis, he is inclined to attribute the symptom to the existence of gout in the constitution, and its effect on the dental nerves.

One of the cases relating to this subject, contained in Dr. Graves's Clinical Lectures, is as follows: "A gentleman, aged 45, slightly made, muscular, and born of healthy parents, was attacked with shivering and loss of power of the left side after a severe wetting. He recovered under appropriate treatment, but in

about a year afterwards, began to observe a tendency to grind his teeth, which gradually increased to such an extent as to prove a nuisance to himself and every one about him. Under these circumstances he applied to an eminent surgeon in Dublin, who applied the actual cautery behind his ears, slightly affected his system with mercury and extracted one of his teeth,—all with considerable relief, which lasted six months. He then became as bad as ever, and applied to another surgeon, who tried iron in every form, without success; and subsequently, to a third practitioner, who used in addition to leeching, blistering, pustulation with tartar emetic, and various other remedies, but without any favourable result. All this time his medical attendants, so far from suspecting the presence of gout, ridiculed the idea of its existence. About three months ago this gentleman came to Dublin, went to dine at the house of a friend, and with some others, supped late at night and drank whiskey-punch. Next day he had vomiting, purging and epigastric tenderness, and on the day after, the ball of his great toe became swollen, hot, and exquisitely painful, leaving no doubt as to the nature of the affection. In this gentleman's case the grinding of the teeth is not constant, but is always greatest when the stomach is most deranged. The teeth in the under jaw are all sound; three or four of the molars of the upper jaw have been extracted. The four upper incisors are ground nearly half way through to the gum on the one side, while the others are very little worn. By

pressing the tongue against the upper incisors, or by touching a certain point of one particular tooth, he can at any time arrest the tendency to grind, and can suspend it as long as pressure is continued in the manner just described."

From a careful perusal of the cases cited by Dr. Graves, I must confess, that I am by no means convinced that the peculiar symptom described by him, the grinding of the teeth, is dependent on the gouty state of the system, but should be more inclined to look upon it as connected with a peculiar form of the dyspepsia occurring sometimes in gouty habits.

Neuralgia is not an uncommon manifestation of gout, and may occur in various situations; sometimes the branches of the fifth pair are implicated, and frequently the sciatic nerve, and more rarely other spinal nerves. I have met with many instances of these different forms of neuralgia, which are exceedingly difficult to diagnose, unless alternating with, or accompanied by, joint disease. Local paralysis appears at times to depend on the existence of a gouty habit, and a case of facial paralysis once came under my own care, which disappeared on the occurrence of regular gout, and the patient was afterwards subject to the ordinary forms of the disease. In such instances, it is a question if the neuralgia or paralysis is induced simply by the impure state of the blood, or whether a real inflammatory action is set up in the sheath of the nerves or the fibrous coverings of the spinal cord.

Hysteria and Hypochondriasis.—Sometimes the development of hysterical symptoms is caused by a gouty state of system and becomes relieved by the occurrence of articular gout. Such instances are usually seen in women who strongly inherit gout, especially when there is an irregularity in the catamenia, or soon after the period of their cessation; in such cases it seems to depend on an impure condition of the blood, but there are wanting the exciting causes necessary to bring about an attack of regular gout. I have seen several cases where the spinal tenderness and articular affection clearly alternated with each other. In the male, I have in several instances seen well-marked hypochondriasis, obviously connected with the gouty habit, and relieved by the occurrence of gout in the joints.

In some patients it seems probable that a gouty condition of the uterus or its appendages, may be the primary cause of the hysteria.

Headache.—A forcible illustration of the connection between headache and a gouty condition of the system is seen in the following case. A lady, sixty years of age, having enjoyed very good health all her life, consulted me on account of a very intense headache, from which she had suffered about seventeen days; the pain was felt chiefly at the vertex and back of the head, and was somewhat periodic in character, often lasting about an hour, then ceasing for two or three hours, and again returning; however, for the

last two days prior to my seeing her, the pain had been continuous. On examination it was found that there was distinct heat and tenderness of the painful part. This lady had never experienced any gout, and I considered the affection at first as hysterical, and prescribed accordingly. However, on the next evening the pain suddenly left the head, and the ball of the left great toe became acutely painful and tender, and after a few hours, swollen, red, and shining on the surface; in fact the patient was suffering simply from a severe attack of genuine gout, which ran its ordinary course. A second fit implicating the same joint, occurred after a few months, but not preceded by any headache or other irregular manifestation of gout.

Epilepsy, Apoplexy, Mania, &c.—More serious affections of the nervous system occasionally arise, depending on the central portions of the system being involved. Sometimes epilepsy appears to be connected with a gouty habit. Van Swieten mentions a case in which the fits ceased as soon as a regular paroxysm of gout ensued, and several instances of the kind have come under my own observation; in one patient, an old man, several epileptic fits occurred before their nature was suspected, but in a short time joint affection showed itself and the head symptoms ceased; prior to the development of the articular gout, an examination of the blood, taken from the temples by cupping, had shown the existence of a large amount of uric acid.

In another case, that of a gentleman sixty-eight years of age, who had suffered from regular gout for about twenty years, an epileptic fit, lasting some time, occurred, and in the space of six weeks this was followed by a second fit; but during the subsequent two years and a half there was no return of the fits, but regular articular gout, which had been checked before the occurrence of the epileptic seizure, manifested itself from time to time.

Gouty mania is occasionally seen, and one instance which rapidly supervened after the cessation of the joint affection has been already alluded to. In another case when slight wandering occurred, the progress of the affection was interesting, showing the probability of the membranes of the brain being affected with gouty inflammation.

A gentleman subjected to great mental and bodily fatigue, and likewise exposed to cold, became ill; his head was hot and painful, he wandered at night; in addition to which there was considerable febrile disturbance; the cerebral symptoms did not yield to ordinary treatment, but suddenly disappeared, when one of the great toes became affected with acute gout. This patient had very occasionally been subject to slight attacks of regular gout, but these had been confined to the great toes.

Another gentleman has recently been under my care suffering from gouty mania, and his case is not devoid of interest. He is over seventy years of age, and has for some lengthened period been subject to

articular gout, but of no great severity. Shortly after exposure to cold in an open carriage and becoming chilled, he felt gouty pains and swelling in one wrist; this continued for a few days, but suddenly disappeared, and his behaviour at the same time became altered, and he soon exhibited symptoms of complete mental derangement. This state of mind remained for some weeks, but his reason was afterwards completely restored; the inflammation returning in the wrist and hand, and continuing obstinately for some time.

In connection with this subject, I may state, that in some attacks of epilepsy, paralysis, and apoplexy, occurring in persons not known to have had gout, I have found the blood rich in uric acid; the value of this fact cannot be determined now, but must be left to future observations and inquiry. Are these cerebral affections ever connected with gout, or does the shock caused by sudden mischief to the brain or spine, cause defective elimination of the uric acid by the kidneys? At present, I am inclined to regard the latter view as most probably correct. In connection with the subject of cerebral affections, I may state, that hemicrania is not uncommon in gouty subjects.

Gouty Affection of Spinal Cord.—Instances of the spinal cord being implicated by gout have occasionally been noticed, and a well-marked case has come under my own care in a gentleman who suffered from pain

and tenderness in the upper part of the lumbar spine, great pain in the legs, and hyperæsthesia, together with extreme depression of the system. During the manifestation of these symptoms, which lasted for some weeks, gout appeared from time to time in moderate intensity in both great toes, and the result of the case, which was most satisfactory, made it probable that it was one of gouty inflammation affecting the meninges of the spinal cord. I have also records of two other cases, in which the spinal structures appeared to be attacked with true gouty inflammation, though in a less degree than in the above instance. Dr. Graves has also related some cases occurring in gouty subjects, in which spinal symptoms manifested themselves during life, and the cord was found softened after death; but, from any evidence shown to the contrary, they might have been ordinary cases of softening of the spinal marrow; in one instance, it is stated that some relief was afforded when gout appeared in the feet, but this must not be taken as an absolute proof of its gouty character, seeing that the relief might have been due to the derivative effect of the inflammation in a distant part. As to the appearance of deposits of earthy matter upon the meninges of the brain and cord, and in the sheaths of the nerves, I may state, that in no instance has it been shown that they were in any way connected with gouty inflammation; they probably consisted of phosphate and carbonate of lime, and not of urate of soda, and the former salts

never occur as the products of true gout; for when lime salts have been found in gouty concretions they have resulted either from the tissues in which they have occurred, or from ordinary inflammation having been set up around the true gouty deposits.

As in the case of other supposed abnormal forms of gout, so with affections of the brain and spine, we must be extremely cautious in making our diagnosis, and remember that serious organic mischief may occur in the central parts of the nervous system in gouty subjects, and still be essentially independent of the diathesis. At the same time, when such mischief occurs, the ordinary development of gout may probably be more or less checked; it is also probable that the cerebral affection, although not dependent on, may still be modified by, the gouty state of the habit.

Treatment of Retrocedent Gout.—The treatment of retrocedent gout is simple; and we must be guided in each case by the knowledge we can obtain of its real nature. If the stomach be affected, and there is no evidence of the existence of inflammation, as shown by the want of febrile disturbance, the condition of the tongue, and the absence of tenderness on pressure, then stimulants, as ether, chloroform, ammonia, and aromatics, may be administered, and if the pain be very intense, opium. Vomiting should also be promoted by diluents, and counter-irritation applied over the epigastrium and left hypochondrium.

Brandy is sometimes of great use, but it is well not to employ stimulants too liberally, as the symptoms often yield to remedies less likely to be followed by mischief. If there be evidence of an inflammatory state of the stomach, leeches, sedatives, as hydrocyanic acid, and alkalies, are indicated, but such cases are very rare.

At the time we are employing the remedies just enumerated, we should not neglect to pay attention to the extremities, for, by the use of warmth and counter-irritation, we may frequently bring back the inflammation to these parts, and thus relieve the retrocedent affection.

When the heart is the seat of retrocedence, the same remedies may be applied at the commencement, and continued until the depression of the circulation has been removed; when the head is implicated, similar treatment to that which would be adopted in the corresponding affections if they occurred in other subjects, must be resorted to, but somewhat modified by our knowledge of the existence of gout in the system, and of the propriety of endeavouring to cause its return to the extremities.

Treatment of other forms of Irregular Gout.—No simple method can be given for the treatment of the various forms of irregular gout which we have described, as it must necessarily differ much in different cases. Some general rules may, however, be laid down for guidance. In cases in which the heart,

lungs, urinary organs, or nervous system are affected, as these are parts of the body of great importance, it should be our endeavour to give relief by inducing gouty inflammation of the extremities, an object best accomplished by the application of warmth and moderate counter-irritation to these parts, as by hot bottles, mustard poultices, and other similar applications.

We should also aim at correcting the gouty diathesis, by the employment of the various remedial means enumerated in the treatment of chronic gout, but at the same time we should carefully avoid producing any depression.

When there is evidence of the presence of inflammation in any important organ, local depletion may be necessary, and the case may be treated as ordinary inflammation; but it should always be borne in mind, that a peculiar state of the system is present which modifies to a great extent the symptoms, and demands peculiar means for its removal.

The value of colchicum in the irregular forms of gout has not been quite satisfactorily ascertained; Sir H. Holland is of opinion that its influence is not limited to the removal of gout from the joints, but extends to the relief of the disease, even when it assumes the most irregular and changeable aspects. My own experience accords completely with that of Sir H. Holland, as regards the value of colchicum in gouty inflammation of the articular structures, but I have not yet sufficient evidence to enable me to decide

whether the remedy is potent in removing symptoms which are simply functional, or entirely independent of inflammatory action; at the same time I am convinced that its judicious employment in most of the irregular manifest is attended with very considerable adva

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CHAPTER XV.

RHEUMATIC GOUT:—REMARKS ON THE USE OF THE NAME—CONFUSION ARISING FROM THE EMPLOYMENT OF THE TERM—DIFFERENT DISEASES INCLUDED UNDER THE HEAD OF RHEUMATIC GOUT—CASES OF TRUE GOUT TO WHICH THE TITLE IS GIVEN—CASES OF SUB-ACUTE RHEUMATISM—DIAGNOSIS OF GOUT AND RHEUMATISM—CAPSULAR RHEUMATISM—RHEUMATOID ARTHRITIS—THE CHRONIC RHEUMATIC ARTHRITIS OF ADAMS—NODOSITY OF THE JOINTS OF HAYGARTH—SYMPTOMS—ANATOMICAL CHARACTERS—CAUSES—PATHOLOGY—DIAGNOSIS—TABLE EXHIBITING THE DIFFERENTIAL DIAGNOSIS OF GOUT, RHEUMATISM, AND RHEUMATOID ARTHRITIS—TREATMENT OF RHEUMATIC GOUT—ILLUSTRATIVE CASES OF RHEUMATOID ARTHRITIS.

THE term rheumatic gout is applied to so many different forms of disease that it is exceedingly difficult to define what is intended to be understood by it. The compound name would naturally imply that the disorder itself was complex, and that it depended on a union of the two separate diseases, gout and rheumatism. The name is often employed under this supposition, but in many works on medicine the term is used to designate a disease differing altogether from either of these affections, as far as its intimate pathology is concerned.

Under these circumstances it will be necessary to enter somewhat fully into the characters of the diseases which have been thus confounded, and to point out the method of clearly distinguishing each

of them. But few authors recognise the combination of gout and rheumatism, and many are strongly opposed to the doctrine of their union; no mention of it is made in the works of Boerhaave, Van Swieten, or of Drs. Cullen, Heberden, or Watson; Sir C. Scudamore remarks in reference to this subject, that textures which have been long affected with gout become so weakened as to be very susceptible of vicissitudes of temperature, and thus the disorder may partake of the character of rheumatism. It was only in this way that he could attach any propriety to the very common expression, *rheumatic gout*. It would appear from the above that the term is often employed, but seldom attempted to be accurately defined.

Our first aim in the present chapter will be to state succinctly the diagnostic character of gout and rheumatism both in their acute and chronic forms, and afterwards to describe certain other diseases which have been called at different times and by different authors by the name of rheumatic gout. To make a correct diagnosis of these disorders, so frequently mistaken for each other, is of great moment, as their appropriate treatment is of a very different character.

Gout cannot easily be mistaken for acute rheumatism when each malady is exhibited in its typical form; the subjects in which the diseases usually occur differ considerably, the first being most common in men after middle age, and in those who have lived freely; the second is at least as frequent in females, usually in the young and those of enfeebled powers.

The characters of the diseases are also dissimilar. Gout, in its early seizures, ordinarily affects but one or two joints, and commonly the ball of the great toe, and the inflammation is accompanied with comparatively little fever but with much local pain, œdema, and subsequent desquamation of the cuticle; the attacks are for the most part periodic, and gradually implicate a larger number of the joints. Rheumatism, on the contrary, generally affects many and large joints, even at first, and the upper extremities equally with the lower; the fever is likewise out of proportion to the local inflammation, and, although the disease is apt to return upon re-exposure to its exciting causes, still no periodicity can be traced in its visitations. Gout may be further separated from rheumatism by the study of hereditary influence, of the predisposing and exciting causes of the two diseases, as likewise of the great tendency to acute cardiac affection in the latter. Notwithstanding the apparent facility in the diagnosis of typical cases, there are others very difficult to separate; some such we have given in our description of acute gout, and these require different methods of analysis, involving a knowledge of their more intimate pathology.

In gout we have proved beyond question that the blood is invariably impregnated with uric acid, and we are in a position equally to prove that in genuine acute rheumatism this principle is absent; in an examination of forty cases of the latter disease exhibiting all its typical peculiarities, the salient points

of which will be found in the Appendix, no trace was discovered by the process before detailed.

Furthermore, we have demonstrated that true gouty inflammation is always accompanied with the deposition of urate of soda in the structures primarily inflamed, and from the examination of the joints of numerous subjects who had suffered during life from acute rheumatism I can testify that no such alteration ever ensues.

The former of these means of distinguishing gout from rheumatism can often be made available for clinical purposes, either by an examination of the blood or blister serum, the latter can of course only be of service in pathological investigations. It must be remembered that these methods of diagnosis are positive only as regards gout, but negative as regards rheumatism, for the absence of the above named phenomena will in no way separate rheumatism from other diseases with which it is sometimes confounded.

In the chronic stage of the diseases, the separation of gout and rheumatism by the ordinary symptoms which present themselves, becomes in some instances a difficult task, even to those who have given special attention to the subject; the forms most apt to be mistaken are chronic gout affecting both the large and small joints and unaccompanied with any external deposits or chalk stones, and certain forms of subacute rheumatism where the same structures are implicated; the external phenomena are then almost the same, probably but little febrile disturbance is

present, the joints are but slightly swollen, and there is no redness of surface.

A careful investigation of the history of the cases will do much: if the disease originally commenced in the great toe, and gradually became more extended in after attacks; if it began about the middle age, or bordering upon this, and the patient had lived freely, indulging in wine or malt liquors; then it is in all probability a case of gout. In many subjects the examination of the external ear will throw considerable light, and I have often been able to arrive quickly at a correct diagnosis by finding the presence of a spot or two upon the helix. Plate I. fig. 1, represents the ear of a patient having but one external deposit, and the true nature of his case was thus at first discovered, and in the chapter on chronic gout other cases will be found illustrative of the above remark. Instances occasionally occur in which the history, from peculiar circumstances, is of little value or cannot be procured, and where there are no external signs on which the diagnosis can be founded; these are rare, but any one frequently consulted on such subjects must have now and then felt a difficulty. In some of these cases I have derived much assistance from an examination of the blood or blister fluid, and a careful attention of the effects of drugs has often afforded much additional aid, as the inflammation of gout is relieved by the administration of colchicum in an infinitely more decided manner than that dependent on rheumatism.

October, 1862. An interesting example illustrating

the difficulties of making a diagnosis in certain cases of joint disease, and the great advantage derived from the examination of the serum, is now under my care at the hospital.

A man, O. H., aged forty-nine, a German, has lived in England five years; by occupation a musician, often playing in the streets at watering places.

His father died of phthisis, his paternal grandfather was subject to gout.

During the latter part of this season, when at Ramsgate, the weather was stormy, and the patient often exposed to wet for hours together.

One day he suffered from great coldness of his fingers and toes, which, however, soon became painful, hot, red, and exquisitely tender, and this state continued without improvement till his return to London and entry into the hospital, a period of about ten days.

When admitted his condition was as follows:—

The middle finger of the right hand is the most painful and the most swollen, next to this the forefinger of the left hand; this he attributes to the fact of his having carried heavy music-books when his fingers were quite numbed, the chief weight resting upon these fingers. The great toe of the left foot, and the dorsum of the right one are also much swollen, red, and very painful, the pains are greatly increased at night: the tongue is much furred, there is loss of appetite, and some thirst. Pulse 68.

The case certainly presented points of considerable difficulty in its diagnosis; cold appeared to be the

exciting cause, he had, it is true, usually drank a little porter each day, but denied having been accustomed ever to take it in excess; it must be remembered that until some time after his admission it was not known that his grandfather had suffered from gout. I was inclined on my first visit to look upon the case as one of acute rheumatoid arthritis, or possibly of sub-acute rheumatism affecting the smaller articulations; still I had my suspicion of its gouty character, and with the view of solving the difficulty, I had a small amount (2 fluid ounces) of blood taken from the arm. The serum of this blood, when examined by the uric acid thread experiment, gave evidence of containing a very large amount of uric acid, the threads being completely studded with crystals; the examination at once threw a light on the case, and led to its more complete investigation, and the full knowledge of its intimate nature. At first the patient was ordered camphor julep three times a day, and continued it for six days, at the end of which time the condition of the joints was much the same as on admission. Half a drachm of colchicum wine was then added to the draught, and after a day or so he was markedly relieved by it, and soon became well.

A more searching investigation showed the presence of two very small white nodules under the fold of the helix of the left ear, and also of a few points of the same white matter on the palmar surface, near the end of the left index finger, and covered only by

a thin cuticle. These deposits were found to be crystalline, and to consist of urate of soda.

Having shown how gout may be separated from rheumatism, the question arises, can they coexist, and is there a disease to which the term *rheumatic gout* can properly be applied? For my own part, although far from denying the possibility of acute rheumatism attacking either an individual predisposed to gout, or one having already suffered from visitations of the disorder, or, on the other hand, of gout supervening where rheumatism has previously existed; still I am convinced, after a long and careful study of the subject, that no combination of the two diseases, as assumed by the title, is ever seen in nature. In my own practice, I have found the name rheumatic gout applied to many diverse maladies, sometimes to true gout, when it has travelled above the knees, more especially when it has implicated the upper extremities; a patient frequently thus expresses himself on this subject—Formerly I was subject to attacks of gout, but now I am suffering from rheumatic gout. Yet in such a case his disease has throughout its course steadily and characteristically progressed, and remains as typical of gout as on the day that he first felt the twinges of the toe. Sometimes the term is applied to chronic or sub-acute rheumatism, more especially when not commencing with rheumatic fever; but the term rheumatic gout is more commonly given, particularly by the medical profession, to a disease having a peculiar pathology, in no way related to gout, and not

necessarily to rheumatism, and which Dr. Adams, of Dublin, has described under the head of Chronic Rheumatic Arthritis, the nature and symptoms of which we shall shortly consider.

I should mention that now and then, especially when the large joints are alone implicated, gout is mistaken for rheumatism, and a careful perusal of Dr. Macleod's Lectures has convinced me that some of the cases included by that physician under the term *capsular rheumatism* are merely examples of gout. Dr. Macleod almost admits this himself when he states that the external phenomena are often very similar, the morbid appearances the same, and colchicum the specific remedy. If the contents of Dr. Macleod's works be attentively examined and analysed, much reason will be found to doubt altogether the existence of a special disease entitled to the name of *capsular rheumatism*, for it will be seen that many different disorders besides genuine gout are there recorded; for example, affections connected with urethral discharge, and cases of purulent inflammation of the joints.

RHEUMATOID ARTHRITIS.

Chronic Rheumatic Arthritis, Rheumatic Gout.—Rhumatisme Noueux, Usure des Cartilages Articulaires. This affection is distinctly pointed out by Heberden, who speaks of an articular disease, not commencing in

the great toe, but preferring other joints, and in its progress differing so much from gout, and also from rheumatism, that it should be distinguished from both by some peculiar name. Heberden remarks that in this disease, though the pain is much less violent, the swelling is greater than in gout, and its peculiarity chiefly consists in the great and lasting feebleness which it engenders, causing the limbs to be more weakened in two years than they would be by regular gout in twenty.

The same disease is designated *Nodosity of the joints* by Dr. Haygarth, and considered to differ both from gout and rheumatism, and by Cruvelhier *Usures des cartilages articulaires*, and Dr. Adams, of Dublin, who has carefully studied its morbid anatomy, proposes the name *chronic rheumatic arthritis*.

Sometimes the affection has received a name dependent on its situation, for example, rheumatic gout, when the wrists, hands, and feet are affected; chronic rheumatism, when the shoulder, elbow, or knee, either singly or simultaneously; and *morbus coxæ senilis*, when located in the hip.

Dr. Haygarth was fully alive to the importance of giving to this form of arthritis a distinct name, but the term nodosity of the joints hardly expresses what is intended to be conveyed, as a nodose condition may be produced by many causes: chronic rheumatic arthritis is preferable to rheumatic gout, for although the disease under consideration differs considerably from rheumatism in its pathology, still it is sometimes

excited by its attacks, and at times resembles it in its symptoms.

Dr. Fuller describes it under the name of rheumatic gout, although he allows that it differs considerably from both affections, for he says, "Rheumatic gout is not a mere variety of gout, or of rheumatism, nor is it a compound of the two diseases; it is essentially distinct from them both, has a special pathology of its own, and requires a distinctive title."

If we agree to name a disease simply from its external characters, then I admit that the term rheumatic gout is not inappropriate; but if we advance further, and have regard to its more intimate pathology, then I deny the propriety of the term: acting upon the former principle, we should be equally justified in calling some cases of scarlatina or measles by the compound term of rubeolo-scarlatina, and we know that these diseases were not separated two centuries ago; but we are now convinced that, although one may present many of the characters of the other, yet in their real nature they altogether differ, each being dependent on the presence of a specific poison.

Although unwilling to add to the number of names, I cannot help expressing a desire that one may be found for the disease under consideration, not implying any necessary relation to gout or rheumatism; perhaps *Rheumatoid Arthritis* would answer the object, by which term I should wish to imply an inflammatory affection of the joints, not unlike rheumatism in some

of its characters, but differing materially from it in its pathology.

I propose giving a short sketch of the affection as I have myself witnessed it, pointing out any differences in the experience of others, when such are important.

Rheumatoid arthritis is met with in the young and old, among rich and poor, and in both sexes. Dr. Adams considers that in males the hip joint is most affected, in females the wrists and hands, and that it is most commonly found among the labouring poor; but, on the other hand, Sir B. Brodie thinks that it is most common in the upper classes of society; a difference of opinion probably explainable by a difference in the class of patients more prominently brought under each surgeon's notice.

The affection, as far as my own experience enables me to form an opinion, more frequently occurs in individuals who have been exposed to the influence of powerfully depressing causes, either mental or physical, but when it is excited by acute rheumatism, such antecedents may not be met with; still, many cases have come under my notice, in which the patient was previously in apparent good health, and the disease has arisen without any assignable cause.

Rheumatoid arthritis occasionally occurs in an acute form, but more usually it assumes a chronic character throughout its whole course. When acute, it presents many of the characters of rheumatic fever, and in some instances the diagnosis in the early stages

is a matter of considerable difficulty. However, as the disease advances the separation is more readily made.

There is usually in acute rheumatoid arthritis but little of the copious characteristic perspiration of true rheumatic fever, and, I believe, in all cases, an absence of any inflammation of the cardiac structures. The febrile disturbance again is much less than in acute rheumatism, and is more in proportion to the number and importance of the implicated joints. When chronic, the most prominent symptoms of rheumatoid arthritis are as follows; pain in the joints, attended at first with little or no swelling, sometimes increased at night and by heat; any attempt to move an affected joint augments the pain, particularly if it has been at rest, and patients are frequently quite unable from this cause to stir in bed on first waking; after a short time the joints enlarge from the increased secretion of fluid in the articular cavities, which is usually capable of detection by imparting a soft and fluctuating sensation to the touch; at a later stage of the disease, absorption of the fluid usually takes place, and the swollen joints become gradually smaller and harder.

There is but slight accompanying fever, and but little constitutional disturbance. In some instances the larger joints, as the knees, ankles, wrists, and elbows, are peculiarly selected, in others, the smaller articulations only are attacked, but frequently both large and small joints indifferently. Although this

form of arthritis is migratory, affecting joint after joint, yet when it has once invaded them, it seldom leaves any free from mischief, and when very many joints have been implicated, the patient is often reduced to a state of miserable helplessness.

Plate IV. fig. 1, represents the hand of a woman, in whom the disease was just commencing in this member, and it will be observed that several of the smaller articulations are much swollen from the presence of fluid in the cavities. The first phalangeal joint of the ring finger exhibits the phenomena in a well-marked form; some distension of the wrist joint will also be noticed, depending on the same cause. In this patient the knees and other larger joints were so seriously injured, that she was much crippled.

Fig. 31 represents the hand of another patient, the drawing being taken from a plaster cast; the peculiarity of the deformity, the twisting outwards of the fingers, is produced by serious injury of the smaller articulations.

A more chronic form of the disease, principally affecting the smaller joints, and especially the last phalanges of the hand, is frequently met with. Heberden has a small chapter on the subject in his Commentaries, entitled *Digitorum nodi*, and consisting of the following query:—

"What are those little hard knobs, about the size
ea, which are frequently seen upon the fingers,
a little below the top, near the joint?
o connection with the gout, being found

in persons who never had it; they continue for life; and being hardly ever attended with pain, or disposed to become sores, are rather unsightly than inconvenient, though they must be some little hindrance to the free use of the fingers."

Fig. 31.*

Dr. Begbie thinks the nodules are connected with gout, or at least that they are only met with in what he terms a gouty diathesis, but he allows that they are often found in those subjects who have never experienced a fit of gout; he nevertheless admits that

* Fig. 31. A drawing from a plaster cast of a hand much distorted from rheumatoid arthritis.

these deposits are different from chalk-stones, being neither so soft or fluctuating at first, nor so hard, or earthlike, in the more advanced stages; they do not acquire the same size which the chalky concretions sometimes attain, neither do they appear to be so immediately beneath the skin, nor do they ever burst or discharge the thin mortar or gritty chalk of the gouty deposit.

I believe Heberden's statement of their having no necessary connection with genuine gout to be correct, and they are certainly found in other subjects than those of a gouty diathesis. I have noticed that several members of the same family are frequently affected with them, but as far as my own experience goes, I cannot recall ever having seen them in patients who had experienced a true fit of gout. It must be remembered, that I completely separate the nodules from true gouty depositions which so frequently occur about the fingers, but which can generally be distinguished. The *digitorum nodi* of Heberden are produced by the arthritic disease under consideration, but modified by its attacking the last phalanges of the fingers. When the disease has advanced to some extent, anchylosis, more or less complete, ensues, the ends of the bones are enlarged and all the surrounding structures become thickened and indurated. This form of the affection frequently troubles elderly people, and is often attended with some disease of the hip or other large joint. Fig. 32 represents a hand in which the ends of several of the fingers are altered in the manner

just described, and some of the joints flexed and immoveable. This form of the disease is often unaccompanied with pain, at least to any inconvenient

Fig. 32.*

amount, but there is frequently some tenderness when pressure is used upon the swollen joint.

Morbid Anatomy of Rheumatoid Arthritis.—The morbid anatomy of the disease has been carefully studied by some pathologists, but especially by Dr. Adams, whose results I will endeavour to give in a small compass.

The fibro-synovial structures of the joints are much altered, the capsules become much distended with synovial fluid, and exhibit all the signs of chronic inflammation; when the synovia afterwards becomes

* Fig. 32. Hand of a lady, with nodules and distortions induced by rheumatoid arthritis; she was suffering from a chronic affection of one hip joint of a similar nature.

absorbed, the capsular membrane is left much thickened. The internal structures—as the round ligament in the hip-joint, the tendon of the biceps in the shoulder—become destroyed, and are sometimes entirely removed. When the disease has been present in a joint for a long time, the articular cartilages are absorbed, and in some very old standing cases even the inter-articular cartilages; this is occasionally seen in the knee-joint, also in the wrist, and the lower jaw. From the amount of the distension caused by the fluid in the early stages, the different ligaments become elongated, and being slow in recovering their natural state, the joints are rendered mobile and more subject to dislocation.

Foreign bodies of varying size and consistence are of frequent occurrence; sometimes these are cartilaginous, sometimes bony, and they are connected with the structures of the joint by ligamentous bands; vascular excrescences are likewise common.

When the articular cartilages have been completely removed, their place is supplied by an ivory-like enamel, remarkable for its polish and hardness; in some joints this enamel covers the entire end of the bone, in others it occurs in streaks or patches in the direction of the movement of the joints. This appears to be formed by the denuded surfaces becoming partly worn away, and a smooth enamel produced by the mutual action of the bones on each other: around the articular surfaces, thus acted upon, bony vegetations often arise.

In most joints after the fluid has become absorbed a crepitus is felt on movement, from the rough surfaces grating against each other.

Mr. E. Canton, in his monograph and elsewhere, has called the attention of the profession to the fact that many of these anatomical changes, usually ascribed by authors to the effects of old age, are really the consequences of rheumatoid arthritis; these remarks apply more particularly to the changes in the ossicula of the ears, causing deafness; the distortion of the joints of the feet, some diseases of the hip joint, and also the peculiar affection of the shoulder joint, accompanied with rupture of the bicipital tendon, primarily regarded as dislocation of the humerus upwards.

The following is a description of the changes which were exhibited by the hands of a male patient who had suffered from this disease, and which much resembled the hand depicted in fig. 31, the dissection being made, and the appearances described by Mr. John Cooke, late House Surgeon to University College Hospital.

General appearance of Hands.—The anterior extremities of the metacarpal bones are broad and prominent and overhang the phalanges. To the touch they are nodular, as if from a number of small tuberous out-growths.

The phalanges are turned obliquely outwards. The first row are placed nearly at a right angle,

cannot be extended, but can be flexed to a somewhat greater extent. They appear as if dislocated on to the palmar aspect of the metacarpal bones. No grating is felt in the metacarpo-phalangeal joints when these bones are moved in any direction.

The second row are bent backwards at various angles to the first; they have a direction more outwards than the first row, and seem displaced on to the dorsal surface of the latter bones. Some over-lap the others, *e.g.*, in right hand the bone of the second finger over-laps that of the third, and the third that of the fourth. The little finger, however, does not turn so much outwards as the other, and in the left hand the bone of the third finger over-laps that of the fourth. All movement in the joints between this row and the next is lost. They can, however, be moved laterally, but no grating is felt.

The third row of bones follow the same direction as the last, and the joints between these and the second do not appear to be diseased.

Only the metacarpo-phalangeal joint of either index finger is affected, and all the joints of the thumbs are perfectly normal.

On removing the skin from the right hand, the more distorted one, the extensor tendons of the fingers are seen, instead of passing over the metacarpo-phalangeal joints, to be pushed aside into the spaces between them, apparently by the enlargement of the ends of the metacarpal bones, the tendons being on the outer side of the fingers on which they act. The flexor

tendons appear to be contracted, they are displaced to the outer side of both the metacarpo-phalangeal joints, and the joints between the first and second phalanges; they then take their usual course with respect to the other joint.

Metacarpo-phalangeal Articulation. — The lateral ligaments are stretched and lax; the anterior ligament is thickened, as also are the other fibrous structures around, which help to form the capsule of the joint. On opening the joint, not a vestige of a synovial membrane is seen, and the articular cartilages have disappeared, except a very small portion on each bone. The articular surface of the metacarpal bone has lost its rounded form; the upper part is expanded and presents numerous small nodular projections, as also does the anterior portion. Laterally the bone is absorbed and has a rough and worm-eaten appearance. On the under part (palmar aspect of the bone) and rather to the outer side is a small surface, the upper third of which is covered with a layer of cartilage, the lower two-thirds with smooth compact bone; this is the only portion which has the appearance of a normal articular surface. The articular surface of the first phalanx is much shallower than natural, is roughened, and only small pieces of the cartilage here and there remain.

A section of the cartilage, from end of metacarpal bone, under the microscope shows patches in which the cells are lost, and their place supplied by a con-

fused mass of very imperfectly formed fibres, decussating with one another in all directions. These patches are abruptly defined. The cells in the neighbourhood are increased to about four times the size of those found in other parts of the cartilage. They are more glistening and their nuclei are not visible. The cells at some distance are much scattered, though somewhat grouped, have no determined arrangement, and are embedded in a finely granular matrix. The cells are oval, angular, and elongated. The nucleus is mostly single, sometimes double; irregular in shape and sometimes containing nucleoli. The granules of the matrix have somewhat a linear arrangement, giving the idea of fibres.

In the parts undergoing calcification it appears that the earthy matter is deposited in the enlarged cells, for on the addition of acetic acid, the earthy matter is dissolved, leaving the cells visible.

The Articulation between First and Second Phalanx.—The ligaments, and all the fibrous structures round, are much thickened. On opening the joint the articular surfaces of the bones are found to be entirely destroyed. The end of the first phalanx has been absorbed on the dorsal and palmar surfaces, so that the bone, instead of being pulley-shaped, is wedge-shaped; both surfaces present numerous little projections, which are composed of fibrous tissue. The end of second phalanx is flattened obliquely from the dorsal to the palmar surface, and covered with little projec-

tions. Between the opposed surfaces of these bones, and uniting them together, are numerous small bands, composed also of well formed fibrous tissue. The extremities of both bones are surrounded by a great number of little bony projections.

The articulation between the second and third phalanx is perfectly healthy.

The metacarpo-phalangeal joints of the index fingers alone are diseased, the other joints are normal.

All the articulations of the thumbs are perfectly healthy.

Causes of Rheumatoid Arthritis. — Rheumatoid arthritis is not unfrequently induced by the same causes which lead to acute rheumatism, more especially by cold, moisture, and depressing agencies. It appears to be occasionally excited by the occurrence of acute rheumatism, which seems in certain cases to cause the joints to take on this particular form of action; but an error is apt to occur in our estimation of this influence, inasmuch as it is probable that rheumatoid arthritis, when it assumes a more than usually severe character, is apt to simulate, and be mistaken for, rheumatic fever. I have known several cases exhibiting all the characters of rheumatoid arthritis, apparently arising from that form of rheumatism which is connected with urethral inflammation, and this was the case with the patient, the dissection of whose hands is described above.

That the sudden production of debility will occasionally give rise to it I have seen many examples, especially in women after severe hemorrhage and rapid child-bearing. Rheumatoid arthritis also occurs in young females labouring under catamenial irregularity, but it appears to me questionable whether any special stress can fairly be laid upon the uterine disturbance. The occurrence of the joint affection appears to be more dependent upon the accompanying depraved condition of the general system, and in numerous cases of the disease I have found the catamenial function perfectly regular. In many instances, however, rheumatoid arthritis arises without any very evident cause, but generally in patients having naturally a weak circulation, even though accompanied with fulness of habit.

Nature of Rheumatoid Arthritis. — Our positive information of the intimate nature of this form of arthritis is exceedingly slight; no proof has yet been afforded that there is a morbid principle present in the blood, or that any alteration in its composition has ensued; in several instances I have sought in vain for uric acid in the blood serum, and have generally found an absence of any specific alteration in the urine. The changes in the inflamed structures are completely different from those which occur either in gout or rheumatism; for deposits of urate of soda are never produced, but in lieu of this, ulceration of the articular cartilages and alterations in the osseous

tissues ensue, which do not result from true gouty or rheumatic inflammation.

It may be that the peculiarities of this form of disease depend rather on the tissues affected than the presence of a morbid matter in the fluids; in other words it may be a form of ulceration and disintegration, in these slightly vascular structures, arising from deficient nutrition. The whole subject requires still further searching investigation.

Dr. Fuller, who appears to have a strong objection to the use of the name Rheumatoid Arthritis, nevertheless holds the same views as myself as to the nature of this affection, or rather as to what the disease is not: this will be seen from the following quotation from his work:—

"The disease should not be regarded as of a hybrid character, or, in other words, made up in part of rheumatism, in part of gout. It is my firm conviction that, just as true rheumatism and true gout do both manifest themselves at different periods of life in the same individual, so rheumatic gout may arise in a person who either has been, or may hereafter become, subject to true rheumatism or true gout, and that it has no connection with either of these diseases, beyond that which attaches to it in virtue of its being a constitutional disorder, producing local manifestations in the joints. Not only does analysis of the blood, and of the fluid effused into the joints in these cases, when well marked and distinctive, prove the absence of lithic acid, the poison of gout, as a cause of the arti-

cular inflammation and enlargement, but the rare occurrence of any gouty deposit in the joints, in cases answering to my description of rheumatic gout, renders it manifest, even to a superficial observer, that the presence of true gouty symptoms is a mere coincidence, and by no means essential to the existence of the disease. On the other hand, analogy furnishes strong grounds for the belief that the articular mischief is not due to the presence of lactic acid, or whatever may be the materies morbi in true rheumatism, whilst the rapidity with which structural disorganization of the joints supervenes, even when the local action is apparently least acute, and when the general symptoms are certainly not indicative of febrile disturbance, is a further proof that it is essentially distinct from true rheumatism, as typified in rheumatic fever, or in the ordinary chronic form of the disease. Indeed, the circumstances under which rheumatic gout occurs, the extraordinary obstinacy of its symptoms, the peculiar alteration in the structure of the joints, which forms its most characteristic feature, and the class of remedies by which it is most successfully combated, all seem to indicate a close connection with some peculiar constitutional taint."

Irregular Forms of Rheumatoid Arthritis.—Occasionally we find other parts than the joints affected with rheumatoid arthritis, and the most common manifestation of the irregular forms are seen in the eyes and ears. When the eyes become implicated, the

disease generally assumes the form of sclerotitis, iritis, and conjunctivitis; frequently these are combined. I am of opinion that many, perhaps the majority of the cases of the so-called rheumatic inflammation of the eye, when not connected with urethral affection, are of the nature of the disease under consideration; but it must be remembered that the tissues of the eye are often affected, both by true gouty and rheumatic inflammation.

The following case is an illustration of rheumatoid arthritis, both of the joints and eye, but slight in character and readily amenable to remedial treatment:

August, 1862.—A lady, forty-seven years of age, possibly inheriting the affection from her maternal grandmother, came under my care, having suffered from the following anomalous symptoms. About ten months since she had noticed that one eye suddenly became affected with redness, accompanied with some irritation; this lasted altogether about four days: since that time, with the exception of one interval of six weeks, the same eye-symptoms have returned about each twenty-one days.

Many months since—in fact, long before the eye affection—this lady had experienced pain in some of the finger-joints, and at the time of her first visit, several of the phalangeal articulations were somewhat swollen and tender. The general health had usually been good, but of late she had flagged somewhat, and when first seen the circulation was decidedly feeble, the pulse small and quick, the extremities cold, and

she was easily tired by excitement. Depressing causes, and especially damp, appeared to cause an increase of all the symptoms. Under the influence of iron and quinine, and afterwards of iron and cod liver oil, this patient soon became greatly relieved, the eye attacks very much less frequent, the circulation much improved, the fingers decidedly better—in fact, almost well, and this was accompanied with a marked increase of flesh. I feel little doubt, from the rapid progress already made, that this patient will ere long be perfectly restored to health.

Another and much more severe case occurred in a patient under my care in the hospital. The following is her history :—

July, 1862.—A woman, R. W., aged thirty-four, married, with two children; none of her family have suffered from gout or rheumatism. About three years since she first suffered from pain and stiffness in the joints of the toes and ankles, which prevented her going about her usual occupations. A few weeks afterwards she noticed that her shoulders and hands were painful, and she has continued to suffer more or less in these different joints. About ten months ago she appeared to have had some inflammatory affection of the lungs, and put herself under homeopathic treatment; she became very weak, and during that time her joints became much deformed and contracted; her eyes also were inflamed, and she almost entirely lost the sight of them. They afterwards improved greatly, but she has never seen

well since. Three months ago the pain in her limbs returned, and she was then admitted into the hospital. Her condition being as follows :—

The right wrist is much stiffened, and painful when attempted to be flexed or extended ; both hands much deformed, the right more than the left ; the metacarpo-phalangeal joints of the right hand are flexed and incapable of extension beyond a few degrees, and some grating sound is heard on movement. Several of the phalangeal joints are more or less stiffened, some permanently flexed, and considerable grating is heard in the joints of the thumbs. The metacarpo-phalangeal joints of the left hand are flexed, and the phalangeal joints are but partially moveable. The left knee is considerably swollen, and some slight fluctuation is felt, but the chief part of the enlargement appears due to the thickening of the tissues. There is much stiffness of the neck, and the patient is incapable of turning the head many degrees ; there is also tenderness about the seventh cervical and first dorsal vertebræ. The eye had remained in a chronic condition since the first attack; the vessels of the sclerotic coat are dilated and turgid, giving a blood-red appearance to the eyes; and the pupils are very large, and but little affected by light: the patient can discern objects, but the vision is extremely indistinct.

Treatment of Rheumatoid Arthritis. — It must be confessed that in this department much is still to be achieved, but at the same time great good can even

now be accomplished by the adoption of judicious means. We must not attempt to treat rheumatoid arthritis as gout, for colchicum is usually injurious, and a spare diet far from beneficial. Nor must we deal with it as with simple rheumatism, for the alkaline treatment so serviceable in the latter is sometimes, if much prolonged, prejudicial in the former disease.

My own experience enables me to state that much injury is frequently produced by injudicious treatment, arising from a wrong view of the nature of this disease, and especially from its being confounded either with true gout or rheumatism.

In rheumatoid arthritis it is of the first importance to pay particular attention to the general health, and for this purpose we must endeavour to give tone to the system, and keep all the functions of the body in healthy action, but always by mild remedies.

In the first place, we must pay attention to the digestive organs, and if they are in any way weakened, endeavour to restore their tone by bitter stomachics, either given alone, or combined with ammonia or small quantities of the mineral acids; or if in a state of irritation, we should try to soothe them by alkalies or other sedatives to the mucous membrane. The condition of the bowels should be attended to, but no drastic purgatives ordered.

The functions of the skin and kidneys should not be overlooked, but there is seldom any marked alteration either in the state of the skin or in the quantity or

quality of the urine, except in the acute form of the disease, when a certain amount of febrile disturbance may be present, and the skin may then become hot and dry, and the urine scanty, high-coloured, giving rise to a deposit of urates.

If there be any great deficiency in the power of the circulation, and especially if anæmia be present, then the preparations of iron usually prove of considerable value: the choice of the preparation must be regulated by the peculiarities of the case; if the habit is relaxed, then the more astringent salts, as the sulphate or perchloride; if anæmia is prominent, then the fer réduit, the ammonio-citrate of iron, or some similar compound. The perseverance for a long time in the use of ferruginous salts is often most useful, more especially when the patient is subject to coldness of the extremities, and other signs of a languid circulation.

Quinine and the various galenical preparations of cinchona bark, given alone or in conjunction with iron or other tonics, are also of much service when there is any evidence of debility either of the nervous or vascular systems.

Cod liver oil in many cases is of striking value, especially in weakened and spare habits, and if there is any undue waste going on in the body; I frequently prescribe it at the same time with tonics, or alternate its use with them.

Our great object throughout the treatment should be, as before observed, to maintain strength, and as

want of tone may depend on various causes, so the tonics must be adapted to individual cases.

There are certain special remedies which may often be beneficially given, more particularly with the view of correcting the morbid action of the joints.

Guaiacum is occasionally of great assistance when there is much deficiency in the extreme circulation. It is best given in the form of the ammoniated tincture of the resin, and this preparation can generally be made to sit easily upon the stomach by being rubbed up with mucilage, and combined with the compound tincture of cardamoms, or some other aromatic. Now and then it irritates the bowels; this can usually be restrained by the addition of a drop or so of tincture of opium. The compound decoction of sarsaparilla is now and then of service, partly from improving the general health, and partly from the guaiacum, serpentary and mezereon which it contains—drugs whose action is in many respects allied to that of guaiacum.

Iodine, either in the form of iodide of iron or iodide of potassium, may frequently be prescribed with advantage, and I have, within the last two years, had a patient under my care, suffering severely from rheumatoid arthritis in many joints both of the upper and lower extremities, who, by perseverance for some months in the use of the syrup of this salt, became quite restored to health. This case was one which threatened at one time to cause complete crippling of many of the most important joints in the body.

Arsenical preparations sometimes appear to be of

signal service, and for several years I have been in the habit of prescribing them in rheumatoid arthritis. Arsenic has undoubtedly a marked action upon the skin, a fact to which every practitioner who has employed it in chronic cutaneous affections can bear witness: it would appear also that it exerts an influence over the fibrous and other tissues of low vitality, and acts upon them as an alterative. In some cases of this disease I have seen marked benefit arise from its use, but in others arsenic has failed to alleviate, though pushed to its full dose and persevered in for a long time. More commonly I have prescribed the drug in the form of the solution of arsenite of potash (Fowler's solution), sometimes as arseniate of soda, which, from some carefully noted observations, I find to act less powerfully upon the system, as an irritant, than the same amount of the metal in the form of an arsenite. In giving the preparations of arsenic it is advisable to pay attention to the state of the stomach in reference to food, and to administer them soon after a meal; they are usually found to cause less irritation to the mucous membrane under such circumstances. In some cases of rheumatoid arthritis I have had reason to think that the arsenic has had the effect of causing great congestion, or even an inflammatory condition of the liver; in these instances, however, the coincidence between the hepatic affection and the administration of the arsenic might possibly have been accidental.

Nux vomica and its alkaloid strychnia are also

occasionally of value, not from their exerting any specific action upon the disease itself, but rather from their influence upon the muscles, which often become much atrophied by long disease, and thus render the patient more completely crippled than he would otherwise be. Strychnia and the extract of nux vomica also give tone to the digestive and assimilating functions, and in this manner often do good. Many other medicines have from time to time been proposed as remedies in this disease, in fact almost all the drugs of the Pharmacopœia, but no sufficient evidence of their value has been adduced, and no advantage would accrue from the discussion of their mode of action.

Mineral waters have frequently been resorted to in rheumatoid arthritis, but I have known great disappointment, and sometimes mischief, result from their employment, arising in many instances from their injudicious selection, the true character of the disease being mistaken. If the more powerful waters, as those of Vichy or Carlsbad, are resorted to, the system becomes lowered and the affection increased, and no good can be afforded by such treatment. The waters most beneficial are those which tend to restore the tone of the system, more especially the ferruginous waters of Schwallbach, Spa, and Tunbridge; these, combined with the accompanying change of air and freedom from care and business, will often be attended with great advantage, and arrest the progress of the disorder.

The local treatment of rheumatoid arthritis must not be overlooked. The disease is inflammatory, though peculiar in its character, and in the early stages the question of the propriety of depletion naturally arises; in some instances a few leeches may be applied with advantage, and moderate counter-irritation is often of great service; this is best effected by painting the part with strong tincture of iodine, or by the use of a blister or croton oil. Rest should be enjoined at first, in the hope of aiding thereby the subsidence of the inflammation; but when the fluid has been absorbed, and the alteration in the joints advanced so far as to forbid all idea of saving the more delicate structures, then a moderate amount of movement is not only not injurious, but beneficial, as it tends to prevent a rigid state of the articulations. The amount of such movement must, in all cases, be regulated by the effects produced: it should always be short of causing any pain or tenderness lasting beyond the day in which it is employed.

Occasionally the use of plasters is beneficial, by giving a certain amount of support to the joints, and also by keeping up a slight counter-irritation; for this purpose I sometimes employ the ammoniacum, or the ammoniacum and mercurial plaster, sometimes the Galbanum, or even the soap or lead plaster if the skin is very irritable. Great stress has been laid by some physicians upon the use of both local and general baths in the treatment of this affection, but my own experience by no means warrants me to attri-

bute to them the value which they have been affirmed by many to possess. When the disease is still present in the system—that is, when fresh joints are from time to time attacked—I believe that baths alone have no power in arresting it, or in altering the condition of the habit leading to its development; but, on the other hand, I freely admit that baths are often most valuable in combatting the sequelæ of the affection; in restoring mobility to the stiffened joints, and in giving suppleness to the muscles. For this purpose salt or sea-water baths or the vapour or Turkish bath may be employed, and warm douches, and shampooing, are also of great advantage. In the acute form of the affection I should place much more confidence in treatment directed to the restoration of the constitution to its healthy state, than in any local applications.

Diet and Regimen.—In rheumatoid arthritis we must not only aim at restoring the digestive and assimilating functions, if deranged, to a healthy state, but we must likewise take care to supply the system with appropriate nourishment. I consider it of the utmost importance throughout the whole course of the disease to support the system, and to allow the patient as nourishing a diet as he is capable of properly digesting. If the appetite is not very good, then food should be given more frequently. Meat should form a considerable portion of the diet, and when it cannot be taken as ordinarily cooked, it is of advantage to have it in the form of potted meat, taking care that

the whole of the juice of the meat be introduced. Any kind of animal food which is found to be easily assimilated may be administered.

I often find that patients suffering from this disease are prohibited from taking malt liquors, but I have every reason to know that when the affection is one of true and uncomplicated rheumatoid arthritis, it is not aggravated by them; in fact, when they agree with the stomach, they often enable the patient to take more solid food, and at the same time cause its more easy assimilation. The same may be said of wines. My rule is to give sufficient of these alcoholic beverages to support the tone of the whole system, but not sufficient to excite the circulation, and thereby produce subsequent reaction.

It is of the utmost importance that the subjects of rheumatoid arthritis should have as much fresh air as possible, and a change of air from time to time is often desirable; if the state of the limbs be such as to prevent walking, or horse exercise, carriage airings should be resorted to. The proper ventilation and temperature of the sitting and sleeping apartments should not be lost sight of.

Lastly, the clothing should be warm, but not sufficient to overheat the patient, or cause too much perspiration; as a rule, flannel should be worn next the skin.

Diagnosis of Rheumatoid Arthritis.—Rheumatoid arthritis, or the so-called rheumatic gout, may be dis-

tinguished both from gout and rheumatism by many characteristic signs. Haygarth, who, as before stated, terms the disease nodosity of the joints, says: "The nodes appear most nearly to resemble gout; both of them are attended with pain and swelling of the joints, but they differ essentially in many distinguishable circumstances. In gout, the skin and other integuments are generally inflamed, with pain, which is very acute, soreness to the touch, redness and swelling of the soft parts, but in no respects like the hardness of bone. The gout attacks the patient in paroxysms of a few days, weeks or months, and has complete intermissions, at first for years, but afterwards for shorter periods. The gout attacks men much more frequently than women. There is one distressful circumstance which distinguishes this disorder; it has no intermission, and but slight remissions, for during the remainder of the patient's life the nodes gradually enlarge, impeding more and more the motion of the limb; the malady spreads to other joints, without leaving or producing any alleviation in those which had been previously attacked."

To this diagnosis of Haygarth, which is for the most part correct, many additional points of difference might be mentioned. Thus as regards the seat of the affection at its first invasion, gout attacking the ball of the great toe, the other disease any joint indiscriminately; the one often leading to the formation of chalk stones, the other never so doing: the character of the blood in the two affections is likewise

widely different, as are also the pathological changes produced in the injured joints.

Between rheumatism and this form of arthritis there is generally a great resemblance, but still many diagnostic phenomena can be detected, as will be observed in the appended tabular arrangement (p. 572) which I have drawn up in order to show at a glance the characteristic differences of gout, rheumatism, and rheumatoid arthritis.

The following are a few cases selected from a large number contained in my case books, illustrative of the different forms of rheumatoid arthritis, and of the peculiarities exhibited by the disease in different subjects.

Case 1.—Slight rheumatoid arthritis in a young lady, quickly relieved and cured by a tonic restorative treatment.

A young lady about seventeen years of age, subject to cold extremities and other signs of a languid circulation, some year or so since experienced pain, tenderness, and swelling of the ankles. At first these were the only joints affected, but after some months the fingers and wrists became implicated, and were so on her first visit; the phalangeal joints were tender, and also a little enlarged; some of the toes were likewise painful, especially the great toes. The tongue was red and somewhat glazed, but there was no thirst; the bowels were regular; the skin acted freely. Pulse small, 96 (probably excited). The mucous membranes were distinctly pale, and a loud venous murmur could

be heard in the neck; the catamenia were regular; she had become thinner of late. Weather appeared to have some influence upon the disease, and she stated that she felt worse when it was cold. Under a treatment directed to fortify the system, consisting of a combination of sulphate of iron and quinine, and the application of a moderately strong tincture of iodine to the joints, this patient rapidly improved, and is now quite well.

Case 2.—Rheumatoid arthritis, probably arising from prolonged fatigue and great mental anxiety.

A lady, fifty years of age, came under my care with the following symptoms. Her general health was formerly pretty good, but she had never been strong. The disease under which she was suffering had commenced rather more than four years ago, at first in the hands and feet. It appeared from her history that she had shortly before this undergone much fatigue, and great and prolonged mental anxiety. From her own account she had been treated by powerfully depressing agents, among which were colchicum and the iodides, also by frequent baths, which, she asserts, made her much worse. At present she experiences pain in almost every part of the body, which is increased when in bed. The knees and ankles are much swollen and stiff, and the shoulders are implicated; many of the fingers are contracted and bent, the thumb joints are tender, and there is much grating felt and heard when they are moved; the wrists are also swollen and painful, and scarcely allow of any

motion. Added to all these discomforts, the patient is unable to move her neck with anything like freedom.

The catamenia ceased about seven years ago.

Case 3.—Rheumatoid arthritis, probably affecting the laryngeal structures, as well as the joints.

A lady, about fifty-eight years of age, when she first consulted me, had suffered from pain in her limbs for twelve or fourteen years, in fact soon after her last confinement: several of the small joints of the hands were stiffened, some a little swollen; the last phalangeal joints of many of her fingers were enlarged, so as to give the peculiar nodose appearance; the hips were distinctly affected and stiffened. Besides these symptoms, this lady suffered from her neck, which had been gradually getting stiff for about four years, but only very inconveniently so for the last eight or nine months; for some time there had been an uncomfortable state of the throat, causing a little hoarseness, and some dry cough with a pricking sensation, but there was no tenderness of the trachea or larynx, and no pulmonary affection could be detected either by percussion or auscultation.

I have seen other cases of laryngeal disease in subjects of rheumatoid arthritis, and am inclined to think that the structures of the larynx are liable to be affected in the same manner as those of the joints; in other words, that the larynx may itself suffer from rheumatoid arthritis.

Case 4.—Rheumatoid arthritis occurring in an old gentleman in his seventy-ninth year.

A gentleman, seventy-nine years of age, previously

enjoying good health, had about six months before coming under my care, felt pains in the joints of the upper extremities; the shoulders and elbows were first affected, afterwards the wrists and hands, when I saw him, the hands were painful, the wrists stiffened, the fingers swollen, and the first row of phalangeal joints much more rigid than the rest. The legs and feet were scarcely implicated; the pain appeared to be very severe, and increased at night so as to prevent sleep; the tongue was somewhat furred, the heart's action weak and intermittent, and there was much irritability of the bladder from prostatic disease. Under the influence of a tonic plan of treatment, consisting at first of bark and ammonia, and afterwards of small doses of reduced iron, the joints became much less swollen and stiff, the pain greatly diminished, and the sleep improved, in fact, the progress of the joint affection appeared to be stopped, and the alterations already induced in the articular structures considerably ameliorated.

I have seen several other patients suffering from rheumatoid arthritis, in whom the disease first appeared when they were considerably advanced in life, that is from sixty years of age and upwards: in such cases it seldom evinces so great a tendency to run a rapid course as in younger subjects, but still it may be acute in its character.

Case 5.—Rheumatoid arthritis coming on at the time of the cessation of the catamenia, and much improved by treatment.

A lady, fifty-two years of age, having no hereditary predisposition to any joint affection, married, and has had three children. The catamenia, which were always very scanty indeed, and occurring at prolonged intervals, ceased about eleven years since. The joint affection appears to have been noticed about the time of this cessation, and after exposure to cold and damp, first in the shoulders, wrists, and hands, afterwards in the knees and ankles. During the last five years she had become much worse, and especially within a few months of her consulting me: all the joints which had been implicated from the first attack, had remained so in a greater or less degree.

This patient was stout, but the complexion and mucous membranes were pale, and the muscles flabby; she was subject to cold extremities; the pulse was weak and quick; at times she felt faint; suffered from atonic dyspepsia and constipation. The knees were greatly swollen, grating much on movement, the wrists very stiff, almost anchylosed, and many of the other joints more or less affected. By treatment, directed to the improvement of the general health, a marked alteration ensued in the state of this patient; her colour improved, the joints became smaller and more flexible, especially the wrists, which were at first so stiffened, and she was enabled to walk some little distance with comparative ease. The treatment consisted in the use of iron and quinine, with the occasional administration of the arsenical solution; and

the application to the joints either of the ammoniacum and mercurial plaster, or of the strong tincture of iodine, but not so as to produce any severe injury to the skin.

Case 6.—Rheumatoid arthritis coming on at the cessation of the catamenia, much improved by treatment.

This lady was fifty-three years of age, and her history and symptoms were as follows. No hereditary predisposition to gout or rheumatism from her parents, but one aunt had suffered from some low form of joint disease, and another from an affection of the eye, termed rheumatic. Her general health had been moderately good; the catamenia had ceased about four years since, at which time the joint affection came on. At first the joints of the hands became swollen, the knees were afterwards implicated, then the ankles, elbows, and so on. At the time of her first visit, the knees were much swollen, mis-shaped, and very stiff; on attempting to move the joints, a loud crackling or grating was heard; the same condition was found in the ankles and elbows, and the wrists and hands were stiff and altered in shape. There was also some stiffness about the neck, and inability to open the mouth wide from the articulations of the lower jaw being implicated. The extremities were very liable to be cold, pulse weak and quick, mucous membranes pale and somewhat anæmiated.

By the aid of fer réduit, continued for a long time, together with the use, at different times, of other tonics,

as bark, cod-liver oil, and small doses of arsenic, and the occasional application of strong tincture of iodine in streaks upon the joints, this patient, from being completely crippled, was able to move about, and was still gaining power when last seen in consultation.

Case 7.—Very severe rheumatoid arthritis, apparently caused by severe cold and damp.

A gentleman, thirty-seven years of age, having no hereditary predisposition to gout or rheumatism, gave the following account of his case. About eleven years since, after a wet journey, he slept in a damp bed, and on the following morning complained of pain and tenderness in different parts of the body. In about a fortnight or three weeks the symptoms subsided, and he was able to return home. Previous to the journey his health had been pretty good. Shortly after his return the articular affection came on, joint after joint becoming painful and tender, without any considerable swelling, but leaving each joint in an almost anchylosed condition. When this patient consulted me, his general health was good, but the state of the joints terrible. Most of the fingers were completely stiffened and distorted, likewise the wrists; the left knee was semiflexed, incapable of being extended, and only able to be bent a few degrees; the right hip joint and left elbow were quite stiff; the neck, also, was scarcely moveable, and many of the other joints more or less affected. He appeared to have been treated at first with colchicum, iodide of potassium, and other remedies, but without any improvement. As the

general health was good at the time of his consulting me, and as the progressive tendency of the joint affection appeared to have stopped, and the articulations which had been attacked were irreparably injured, of course little or nothing remained to be done by medicinal treatment.

Case 8.—Rheumatoid arthritis, illustrative of the influence of frequent childbirth and hemorrhage upon its development.

A lady, aged forty-seven, consulted me, suffering from rheumatoid arthritis, and gave the following account of her case.

Her father and mother had both suffered from joint disease. She herself had had sixteen children, including several miscarriages. The eldest was twenty-seven, and the youngest three years of age. During the last twenty years she had been very weakly, from the frequent labours and attendant hemorrhage.

About a year ago she had first noticed pain and swelling of the hands and wrists, and to some extent of the elbows; since which time many of the joints, both of the upper and lower extremities have been attacked, and after a joint has once been affected, it has always remained in an injured condition.

At the time of her first visit, the shoulders, wrists, hands, knees, and ankles were swollen and painful; the neck was likewise much stiffened from the upper cervical vertebræ being implicated. The pain was considerably increased after the patient had been in bed for an hour or so, and upon waking she was so

stiff as to be unable to move. Her general health was not good; the pulse was weak, 72; the complexion pale and sallow; the skin rather dry; the tongue furred, and the appetite bad. She had also of late lost much flesh. The catamenia had been absent for about eight months, and irregular and scanty for three years.

I have had several other cases under my care, in which rheumatoid arthritis has been rapidly developed, after considerable loss of blood from frequent miscarriages or from numerous labours occurring within a short period.

Case 9.—Rheumatoid arthritis, apparently induced by severe mental depression.

A lady, thirty years of age, consulted me with the following symptoms. Her health had been good, but about ten years since she had had a severe illness, followed by swelling of the body, legs, and face, which lasted about two months, and was termed dropsy. About three years ago, having previously suffered from very severe mental depression, the articular affection appeared, first in the phalangeal joints of the fingers and thumbs, then in the elbows and shoulders, and afterwards in the knees and feet. The right elbow has been especially injured, and is now partially anchylosed, the movements of flexion and extension being very limited. Her general health is now far from good, there is marked anæmia; the catamenia too frequent, the pulse small, and the appetite bad; she has also become much thinner of late.

Under a tonic treatment, consisting of iron, quinine, and cod-liver oil, this patient improved much in general health, but the elbows remained very stiff. The progress of the articular affection, however, has been arrested.

Case 10.—Rheumatoid arthritis, arising without any apparent cause, but preceded by marked derangement of the general health.

A lady, thirty-five years of age, came under my care, suffering from the following symptoms:—

No hereditary tendency to any joint affection could be discovered, her health had usually been tolerably good, but for some little time before the commencement of the joint affection, she had been getting decidedly weaker.

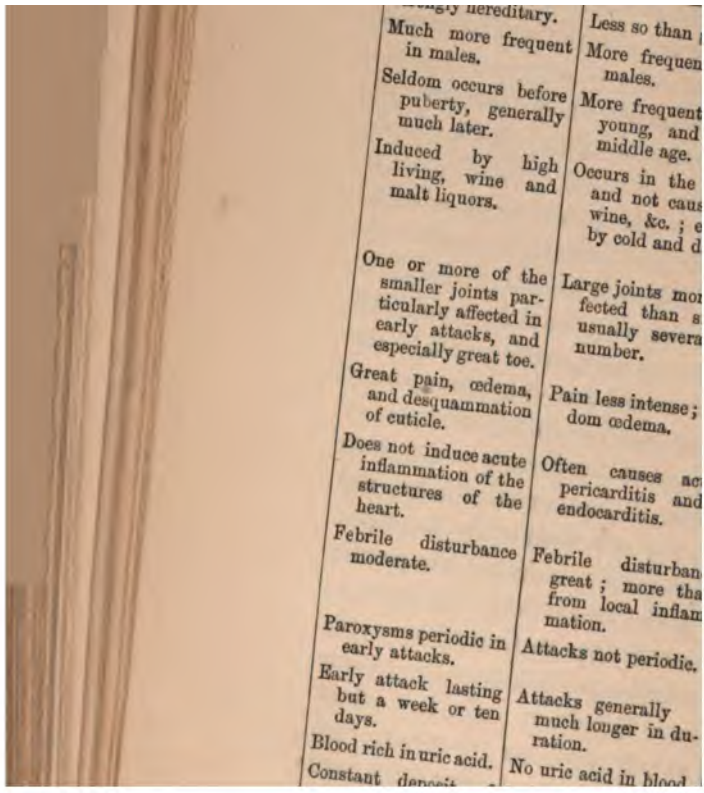
About two months before she consulted me, she had noticed pain in the right ankle, attended with some swelling; the knees soon became stiff, and then the left ankle; soon after this the smaller joints of the hands, and the elbows were implicated. From the first appearance of the disease, the joint affection had never left her, although for a time there was a slight improvement; in fact, the course of the disease has been uniformly progressive, attacking joint after joint, and always leaving them more or less damaged.

When first seen this patient was thin, felt very weak, and was easily fatigued; pulse small and quick; extremities cold; complexion pale, and tongue clean, a little glazed and appetite bad; catamenia

regular. Many of the joints of the fingers were enlarged, tender, and stiff, as likewise the wrists and elbows; the neck was also somewhat rigid. No marked increase of pain was produced by the warmth of the bed, but the joints were always very stiff in the morning.

This patient improved much under the use of cod-liver oil, cinchona bark, and small doses of the arsenical solution, together with the application of a strong tincture of iodine to the joints, which relieved the local symptoms. She is still under treatment.

Miscellaneous Cases.—Many cases of rheumatoid arthritis have come under my notice in which the affection was confined to the phalangeal joints of the fingers, sometimes to the second row or extreme joints. In some instances I have seen one or two members of a family having this form of the disease, and another in which the malady has advanced much further, and implicated many of the articulations both of the upper and lower extremities. In by far the greater number of cases in which the disease has been so limited in its character, the patients have been females, and it has usually occurred after the middle period of life, sometimes in old age. The lady whose hand is represented at page 559, has two sisters, both having the nodular state of the fingers in a well marked degree, but no other joints affected.



...ngly hereditary.	Less so than
Much more frequent in males.	More frequen males.
Seldom occurs before puberty, generally much later.	More frequent young, and middle age.
Induced by high living, wine and malt liquors.	Occurs in the and not caus wine, &c. ; e by cold and d
One or more of the smaller joints particularly affected in early attacks, and especially great toe.	Large joints mo fected than s usually severa number.
Great pain, œdema, and desquammation of cuticle.	Pain less intense; dom œdema.
Does not induce acute inflammation of the structures of the heart.	Often causes ac pericarditis and endocarditis.
Febrile disturbance moderate.	Febrile disturban great ; more tha from local inflam mation.
Paroxysms periodic in early attacks.	Attacks not periodic.
Early attack lasting but a week or ten days.	Attacks generally much longer in du- ration.
Blood rich in uric acid.	No uric acid in blood
Constant deposit ...	

CHAPTER XVI.

DISEASES TO WHICH GOUTY PERSONS ARE PARTICULARLY LIABLE—GRAVEL AND CALCULUS—SCIATICA AND LUMBAGO—KIDNEY DISEASE AND THE SECONDARY CONSEQUENCES OF—LIABILITY OF GOUTY PATIENTS TO BE AFFECTED BY LEAD—PROPHYLACTIC TREATMENT OF GOUT—PROGNOSIS OF RHEUMATOID ARTHRITIS—PROGNOSIS OF GOUT.

THERE are certain diseases which appear to be closely connected with a gouty state of the system, or the so-called gouty diathesis; among these we may mention, more particularly, certain forms of gravel and calculus, kidney disease, and likewise lumbago and sciatica. On the peculiarities that these affections exhibit when they occur in the gouty habit we shall dwell for a short time.

Gravel and Calculus.—As we have shown that it is essential that uric acid should be in abnormal quantities in the blood in order that gout should be produced, although something more is necessary to cause an inflammatory attack, it follows from this that the gouty and (so-called) uric acid diathesis must necessarily be the same, and we should naturally expect to find gouty patients frequently exhibiting symptoms resulting from the presence of such diathesis, more

especially in the passage of uric acid, or urates in the form of the various crystalline and amorphous sands and calculi; the voiding of uric sand by gouty patients, during some period of life, is exceedingly common and the formation of calculi by no means unfrequent; as a rule, when in early life gravel and calculi are formed, in after years gout developes itself in the same individual. It will be remembered that Sydenham himself laboured under the combined miseries of gout and calculus, and in explanation of the co-existence of the two diseases, remarks: "Gout produces calculus in the kidneys, which may arise either from the patient lying so long on his back, or from the secreting organs having so long omitted their functions, or the calculus itself may be a part and parcel of the morbific matter. Be this as it may, the patient is frequently at a loss to know if the stone or gout be the worst disease." Morgagni likewise considered that calculus of the kidneys was often joined with gout, and he relates an instance in which both kidneys were distended from the presence of such concretions. Sir C. Scudamore did not think that there existed much connection between gout and calculus, remarking, that in five hundred patients, only five were so afflicted; still, he qualified his statement by saying that in many cases he had seen concretions discharged from the urethra of considerable size.

Sir R. Blackmore relates that Dr. Wallis attended the celebrated Dr. Hammond, who, when he was

eased of the stone, was sharply attacked with gout, and when freed from gout was grievously, and at last fatally, assaulted by the stone.

I have met with numerous instances of the occurrence of gout and calculus in the same individual, but of few in which they were present at the same time. In these cases, the calculi are usually composed of uric acid or urate of ammonia, but it is not uncommon to find oxalate of lime, either by itself or alternating with urates. Oxalate of lime is likewise frequently present in the urine of gouty subjects in the different forms represented in Plate VI., fig. 8, *a*, *b*, *c*. Such an occurrence is not to be wondered at, as uric acid is readily decomposed into oxalic acid, and the latter acid, as I have proved by repeated observations, is always present in blood which contains an abnormal amount of the urates. Oxalic acid is also capable of being obtained from the secretion of the skin of the same patients.

Lumbago and Sciatica in connection with the Gouty Diathesis.—Lumbago and, more especially, sciatica are of such frequent occurrence in connection with the gouty diathesis, that it is as well to speak of them separately, although they might have been included in the chapter on the irregular forms of gout. It is of the highest importance clearly to make out the correct diagnosis of sciatica, as the treatment adopted for one form may have little effect in alleviating another variety; nay, it may even cause an increase of the symptoms. To make a

correct diagnosis in such cases it is necessary to ascertain many points in the history of the patient, as the amount of hereditary predisposition, the habits of life, especially with regard to the character of the alcoholic beverage the patient has been accustomed to take. Our space will not allow us to enter at length into this subject, but we will give the following case as illustrative of the affection when in connection with the gouty diathesis:—

A gentleman, forty years of age, recently came under my care suffering from sciatica, which, whether originating or not from gout, was evidently kept up by the presence of the diathesis. His father and brother had suffered from gout, and he had himself experienced two or three attacks in the ball of one or other great toe and in one ankle; the first occurring about six years since, the last seven or eight months ago. At the time when the gout was last upon him, he was seized with sciatica on the left side, but he thinks that exposure to cold might have been the exciting cause; the pain was felt chiefly in the hip and outer side of the leg and instep, but not much in the thigh. During the last seven months the sciatica has continued, sometimes a little better, at other times much worse; the pains are increased by standing or walking, but not notably influenced by alterations of temperature. The urine in the early stages was red and thick, but is now pale-coloured and clear: pulse seventy-two: no increased heat of skin.

This patient had been treated for some time by

many of the ordinary remedies for sciatica, but the diet had not been attended to, nor had the presence of the gouty diathesis been taken into account; when placed under a proper regimen, wine and malt liquors being proscribed, and the ordinary medicinal treatment of gout adopted, he rapidly lost his painful affection and was restored to health.

As the kidneys are prone to become contracted in chronic forms of this disease and thereby lose much of their excretory power, it follows that the secondary disorders commonly resulting from such a cause must necessarily be found among the sequelæ of gout. One of the most frequent of these is œdema, either confined to the legs or sometimes of a more general kind; effusions into the cavities are likewise found, constituting ascites, hydrothorax or hydropericardium; in some cases depending on a low form of inflammatory action of the serous membranes, but in others simply on passive effusion. Epilepsy, apoplexy, and paralysis are not unfrequent, and in short, all the secondary effects of chronic albuminuria are observed in different cases of gout. Many of the above disorders occurring under such circumstances are considered as instances of *misplaced* gout, but a strict pathology will scarcely allow of their being thus classified, although they are intimately associated with the gouty diathesis.

The long continuance of a depraved condition of blood also leads to fatty degeneration of some of the tissues, and this is frequently observed in the heart, and may prove the cause of a fatal termination.

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hospital practice, for it was found that from 25 to 30 per cent. of such gouty patients under my care had been affected either with lead colic or paralysis, or at least exhibited the characteristic blue lead line upon the gums. The influence of lead in inducing gout was also rendered probable by the results of some observations in which it appeared that the administration of the salts of this metal diminished in a notable degree the excretion of uric acid by the kidneys. Within the last year or so I have been led to suspect that the converse likewise holds good, or that patients subject to or inheriting gout are more liable than others to be affected by the absorption of lead. The reasons which have led me to form this opinion are the following:—I have seen and heard of individuals who have been affected by lead from drinking water, containing it is true a notable amount of the metal, but still insufficient to produce poisonous effects on other individuals who partook of the same; I have also observed that during the administration of the salts of lead gouty patients exhibited the blue line much sooner than those suffering from other diseases, and that they were also more prone to experience colic and constipation. As I have this subject still under investigation I will not discuss it further at present, but merely call the attention of the profession to the fact as one of much interest and perhaps of considerable importance, seeing that wine and other liquors, as well as drinking-water, are possibly often contaminated with traces

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It has been asserted, that colchicum given before the expected visitations exerts a beneficial influence in warding them off, and Sir Henry Holland relates an instance in which he gave it daily in moderate doses in combination with quinine, for two years, not only with entire exemption from gout, but with singular benefit to the general health, when previously to this treatment scarcely two months passed over without an attack. In certain cases colchicum may be advantageously so prescribed, but I should feel more disposed to trust either to simple salines, or salines combined with aromatic bitters if the digestive organs be much impaired; this treatment when judiciously exhibited is never followed by injurious results, and in many cases has proved so successful as to have allowed the patient even to indulge in wine, without being tormented by his enemy.

Abstinence from wines and malt liquors is often sufficient to prevent the repetition of the attacks of gout, but in many cases, if the patient has been accustomed to take wine freely, it is important to find a substitute for it; this may generally be done by ordering a limited quantity of some distilled spirit, as brandy or whiskey, in order to keep up the tone of the digestive organs and of the circulating system.

The following case is one of many which have come under my care illustrative of the influence of abstaining from wine upon the return of the gouty paroxysms :—

A gentleman, fifty-seven years of age, who inherited

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Prognosis of Rheumatoid
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Prognosis of Gout.—When a patient, otherwise in good health, is suffering from a fit of regular gout, however severe it may be, the prognosis, as far as the attack is concerned, may be considered favourable. I have never known or heard of an instance which terminated fatally. It was a popular belief, until a very recent period, that the appearance of gout was rather to be desired than not; that, in fact, an attack of gout possessed the power of curing every other ailment and of freeing the system from any lurking malady. I have no hesitation in affirming that such is not the case, and I cannot too strongly deprecate the treatment occasionally pursued, of endeavouring to induce an attack of gout for such an ideal purpose. At the present time, I believe, there are few who would venture upon such an assertion, but still it is occasionally made.

Gout has a decided tendency to shorten life, and insurance companies, being fully aware of the fact, are not backward in acting upon it by increasing the amount of premium for the insurance of the lives of those who have suffered from this disease. It is difficult to discover any reliable statistics as to the effect of gout in shortening life, and the rules at different insurance offices as to the increase of premium differ from each other.

At one office, for example, I am informed that no particular rate is adopted for gouty persons, but the additional rate is regulated according to the report of their own physician and that of the medical officers to

the company. At a second office I am told that eleven per cent. is added to the premium, whatever may be the condition of the patient as to gout, provided he is not too much affected to pass the physician; and at a third office I am assured that from two to three years are added to the lives, according to the report of the medical officer.

When once a patient has experienced a fit of gout, he is liable to its recurrence; the interval may indeed be prolonged, even perhaps to many years, by great care and attention, but still, except under peculiar circumstances, a return of the disease may be expected.

In looking over the histories of the cases which have come within my own knowledge, I can find but few exceptions to this rule. An interval of two years, or even more, often occurs between the first and second attack; this is soon, however, reduced to one year, then to a half-year, and so on, as the malady becomes more and more grafted into the constitution. These remarks apply to such patients as take no care to prevent its return. If proper precautions be adopted, and an appropriate plan devised and followed out, a very different course may be given to the disease, even when it has acquired some considerable hold upon the system.

The following are a few exceptions to the above rule as to the progress of gout which I have met with:—

A gentleman, who lived to the age of seventy, had an attack of gout in the ball of the left great toe when thirty-five years of age. From the latter date up to

the time of his death, he was accustomed to live well, and to partake freely of port wine, but he had had no return of the affection; he died suddenly of cardiac disease or aneurism.

Another gentleman, twenty years of age, a medical student, in the spring of the year was attacked about ten o'clock in the morning with excruciating pain in the ball of the great toe. This lasted five or six hours, and left the part so swollen and tender, that he was unable to resume his studies for six days. Thirteen years after he had an attack in the ankle, apparently brought on by over-walking and taking some stout. It is now more than twenty-one years since this last attack, and he has had no return, but occasionally feels darting pains through the joints of the great toe.

This gentleman's father had gout for the first time at sixty-eight years of age, the year in which he died.

Gouty patients sometimes live to a good old age, and occasionally, in the latter part of their lives, the fits become milder and less frequent. A few years since I met with an example of this in a gentleman, then about eighty-four, who had suffered from gout for fifty years. No chalk-stones were visible, and his general health throughout life had been remarkably good; during the ten years previous to my seeing him, although he still suffered occasionally from gout, the fits had become much less frequent and of a milder character. I have met with a few other similar instances, but am inclined to think that they are somewhat exceptional.

After repeated visits, when gout assumes an asthenic and chronic character, and more especially when any crippling of the joints occurs, or when deposits become visible at the surface, it will generally be found that the kidneys have lost much of their uric acid-excreting power, and the urine then often contains a trace of albumen, the blood at the same time being loaded with urates; in these cases the prognosis is much less favourable, for though such patients may live many years under favourable circumstances, still they are liable to be seriously affected by intercurrent disease, severe accidents, and other agencies, which in healthy subjects would be unattended with dangerous consequences.

The following examples illustrate what we have advanced as to the prognosis of gout:—

A gentleman about fifty-four years of age, inheriting gout very strongly, himself suffered from the disease early in life, and before the age of thirty-five had noticed chalk-stones, and was soon crippled, both in the hands and feet, from many of the smaller joints becoming anchylosed. One autumn, when at the seaside, he was exposed to cold, and in lieu of experiencing the ordinary symptoms of catarrh, rapidly sank, apparently from prostration of the vital powers. The urine of this patient was very pale: it now and then exhibited a minute quantity of albumen, but scarcely a trace of uric acid.

Another example occurred in a tall and robust man, who had suffered from gout for many years, and had

concretions about the extremities, as well as several nodules upon the ears; after a severe accident, which caused fracture of the thigh, although he progressed favourably for a few days, he died suddenly, and without apparent cause. At the *post mortem* examination I discovered the kidneys to be very small and contracted, and weighing only two and a half ounces each; the tubuli of the pyramidal portion contained white streaks of urate of soda, and the organ presented an appearance resembling that shown in Plate IV., fig. 2, *a*, *b*.

In the chapters on Morbid Anatomy, other examples will be found, proving the liability of gouty subjects to be suddenly cut off by comparatively slight accidents; it is probable that the fatal termination in such cases is dependent on the state of the kidneys, which can but imperfectly perform their function under ordinary circumstances, but are quite unable to do so when an increased demand is made upon them.

That even slight injuries are accompanied with a considerable waste of tissue, and the necessity for increased elimination, I have proved by the examination of the urine of a patient under the effect of a large blistered surface. The amount of the solid excretion of the urine was found almost double, compared with what it had been for some time previously, and this increased elimination of solid matter was accompanied with a considerable diminution in the weight of the body; it is probable that an increased waste of tissue takes place likewise after severe in-

juries, or during febrile disturbance from any other cause, demanding a healthy condition of the kidneys in order to keep the blood pure.

Besides being affected by acute disease and accidents, patients with impaired kidneys are liable to the occasional supervention of that form of gout which has been named retrocedent, and such metastatic action, whether to the heart, stomach, or brain, may be attended with much danger; moreover, in chronic gout, the blood remains impure even in the interval of the attacks, giving rise in many cases to constant dyspepsia, and hence, indirectly, tending to an imperfect nutrition of the body, a condition of habit which may be termed gouty cachexia, and may lead to the production of organic disease in various important organs.

From what has now been advanced, it will be evident that the examination of the urine for the purpose of ascertaining how far the function of the kidneys has become implicated, is of much value as an aid to the prognosis in many cases of gout. In making such examination I not only determine the presence or absence of albumen, but usually obtain some idea of the manner in which the solid portions of the urine, and especially the uric acid, are excreted; in some instances even a quantitative estimation of the uric acid is desirable.

In concluding my remarks upon this subject I may state, that I consider even a single fit of gout, however slight, should be looked upon as an intimation that the

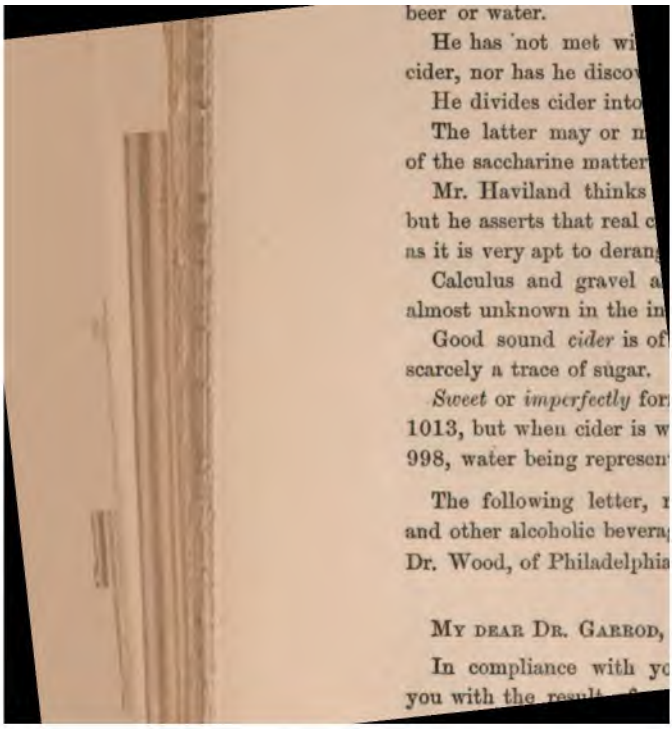
patient cannot go on with impunity in his then habits of life; it is a warning that either he must change them or expect returns of the disease, which as time advances are certain to increase both in frequency and duration, and are likely to embitter and shorten existence.

On the other hand I am equally persuaded that if proper regimenal and medicinal precautions be taken, the gouty patient may be saved from such an alternative, and the disease, instead of increasing in severity, may be gradually mitigated, and probably interfere but little with the comforts of life.

APPENDIX.

Influence of Cider on the production of Gout.

At page 257 it is stated that Cider and similar beverages act to some extent as predisposing causes of gout, although probably a much larger quantity of them is required than of the stronger kinds of malt liquors. I have been recently favoured by Mr. Alfred Haviland, a gentleman practising at Bridgewater, with an account of his experience on this subject, and Dr. Wood, of Philadelphia, has also kindly given me his opinion upon the same. Mr. Haviland acknowledges that there are doubtless many cases of gout in the cider districts, although he has been unable, during a long experience, to establish the fact of a single case having been really due to the drinking of cider; he states that, on looking over the books of the Bridgewater Dispensary, he did not find an entry of a single gouty patient during a period of 30 years, and that a personal experience of four years at the same institution has given the same negative result; and again, during 15 years at another dispensary, where the average number of patients is about 250—nearly all agricultural labourers, with their wives and children—there were only three cases of pure gout, and these occurred in beer drinkers. In fact, he says, if the gouty subjects in his neighbourhood, as a rule, are beer drinkers, they at least take mixtures of different liquors:—



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The latter may or n
of the saccharine matter
Mr. Haviland thinks
but he asserts that real c
ns it is very apt to deran
Calculus and gravel a
almost unknown in the in
Good sound *cider* is of
scarcely a trace of sugar.
Sweet or *imperfectly* for
1013, but when cider is w
998, water being represen

The following letter, r
and other alcoholic bevera
Dr. Wood, of Philadelphia

My dear Dr. Garrod,

In compliance with yo
you with the result

diminution of gout, at least in its acute and more inflammatory form; but as there have been other agencies, which have contributed to the same result, I am unprepared to say how far it is attributable to this substitution, though I think it has not been without effect.

I am quite certain that I have seen the disease result from the excessive use of malt liquor, and quite as certain that I have never known it to be caused by cider, though I am familiar with a considerable population who have long been in the habitual use of this beverage.

In the United States, the different forms of ardent spirits have been largely consumed by the poorer classes, especially whiskey and rum. As a result of this, I have constantly seen in hospital practice much visceral disease of various kinds, and not a few cases of delirium tremens, but to the best of my recollection, gout in not a single instance.

In making the above statement I have, as you perceive, confined myself to simple facts, without any attempt at explanation.

Sincerely your friend,

GEO. B. WOOD.

Dr. A. B. Garrod.

Influence of Lead on the production of Gout.

Since the publication of the first edition of this work, Dr. R. W. Falconer, of Bath, has kindly reminded me, that his grandfather, the late Dr. William Falconer, in 1772, and previously to that time Drs. Musgrave and Huxham had noticed that some relation existed between lead poisoning and gout. Dr. W. Falconer, in his Essay on the Bath Waters, published in 1772, makes the following remarks:— "The Bath waters are likewise of the utmost service in the gouty complaints that sometimes follow the colic of Poictiers, which have been observed and described by Dr. Musgrave,

and since his time by Dr. Huxham." Dr. Falconer has pointed out other passages in works which bear strongly this subject: for example, in the unpublished writing Dr. Caleb H. Parry, published in 1825, the following sage, dated 1807, occurs:—"Gout from Lead.—I obs that, after the palsy from lead, patients of a middle otherwise previously healthy, are very subject to fits gout in the limbs. Mr. C., among others, had gout in foot, and was somewhat relieved by it. These facts pr that lead has the power of producing undue arterial thora, &c."

In Dr. Edward Barlow's Essay on the Bath Waters, p lished in 1822, three cases are mentioned of gout follow "palsy of hands from poison of lead."

Dr. R. W. Falconer has himself, in the British Med Journal, Nov. 2, 1861, related a case of saturnine poisoni followed by gout, and in his letter makes the follow remark:—"We have at times a large number of cases lead poisoning at the Mineral Water Hospital, and some them have been known, after their recovery, to suffer fr gout, but, as far as I can ascertain, they quit the hospita thoroughly relieved, that unless they are again exposed the poison, they remain free from any sequela of it."

TABLE OF ANALYSES OF THE DIFFERENT SPRINGS AT VICHY AND THE NEIGHBOURHOOD.

Contents of a litre of water from each source, the weights expressed in grammes. (Referred to in Chapter XIII.)

	VICHY.								HAUTE-RIVE.	ROUTE DE CUSSET.
	Grande Grille.	Puits Chomel.	Puits Carré.	Lucas.	Hôpital.	Celestins.	Puits de l'enclos des Celestins, Puits Lardy.	Puits Brosson du Parc.	Puits d'Haute-rive.	Puits de Mesdames.
Free carbonic acid . .	0·908	0·768	0·876	1·751	1·067	1·049	1·750	1·555	2·183	1·908
Bicarbonate of soda .	4·883	5·091	4·893	5·004	5·029	5·103	4·910	4·857	4·687	4·016
,, of potassa . .	0·352	0·371	0·378	0·282	0·440	0·315	0·527	0·292	0·189	0·189
,, of magnesia . .	0·303	0·338	0·335	0·275	0·200	0·328	0·238	0·213	0·501	0·425
,, of strontia . .	0·303	0·003	0·003	0·005	0·005	0·005	0·005	0·005	0·003	0·003
,, of lime . . .	0·434	0·427	0·421	0·545	0·570	0·462	0·710	0·614	0·432	0·604
,, of protoxide of iron	0·004	0·004	0·004	0·004	0·004	0·004	0·028	0·004	0·017	0·026
,, of protoxide of manganese .	traces	traces	traces	traces	traces	traces	traces	traces	traces	traces
Sulphate of soda . .	0·291	0·291	0·291	0·291	0·291	0·291	0·314	0·314	0·291	0·250
Phosphate of soda . .	0·130	0·070	0·028	0·070	0·046	0·091	0·081	0·140	0·046	traces
Arseniate of soda . .	0·002	0·002	0·002	0·002	0·002	0·002	0·003	0·002	0·002	0·003
Borate of soda . . .	traces	traces	traces	traces	traces	traces	traces	traces	traces	traces
Chloride of sodium . .	0·534	0·534	0·534	0·518	0·518	0·534	0·534	0·550	0·534	0·355
Silica	0·070	0·070	0·068	0·050	0·050	0·060	0·065	0·055	0·071	0·032
Bituminous matter . .	traces	traces	traces	traces	traces	traces	traces	traces	traces	traces
Total	7·914	7·959	7·833	8·797	8·222	8·244	9·165	8·601	8·956	7·811
Temperature . . .	105° Fah.	111° Fah.	111° Fah.	85° Fah.	87° Fah.	55° Fah.	74° Fah.	72° Fah.	58° to 61° Fah.	Cold.

After repeated visits, when gout assumes an asthenic and chronic character, and more especially when any crippling of the joints occurs, or when deposits become visible at the surface, it will generally be found that the kidneys have lost much of their uric acid-excreting power, and the urine then often contains a trace of albumen, the blood at the same time being loaded with urates; in these cases the prognosis is much less favourable, for though such patients may live many years under favourable circumstances, still they are liable to be seriously affected by intercurrent disease, severe accidents, and other agencies, which in healthy subjects would be unattended with dangerous consequences.

The following examples illustrate what we have advanced as to the prognosis of gout:—

A gentleman about fifty-four years of age, inheriting gout very strongly, himself suffered from the disease early in life, and before the age of thirty-five had noticed chalk-stones, and was soon crippled, both in the hands and feet, from many of the smaller joints becoming anchylosed. One autumn, when at the seaside, he was exposed to cold, and in lieu of experiencing the ordinary symptoms of catarrh, rapidly sank, apparently from prostration of the vital powers. The urine of this patient was very pale: it now and then exhibited a minute quantity of albumen, but scarcely a trace of uric acid.

Another example occurred in a tall and robust man, who had suffered from gout for many years, and had

Analysis of the Kaiserquelle (Source de l'Empereur), Aix-la-Chappelle.

TEMPERATURE, 135° FAH.

In 16 fluid ounces there are contained:

Chloride of sodium	20·71 grs.
Carbonate of soda	6·61 ,,
,, of lime	0·23 ,,
,, of magnesia	0·15 ,,
,, of strontia	0·04 ,,
Sulphate of soda	2·12 ,,
Sulphuret of sodium	0·62 ,,
Phosphate of soda	0·14 ,,
Fluoride of calcium	0·47 ,,
Silica	0·54 ,,
Organic animal matter	0·29 ,,
	31·92 ,,
Carbonic acid	8·00 cub. in.
Sulphuretted hydrogen	0·13 ,, ,,
Nitrogen	18·53 ,, ,,

Analysis of the Sprudel Spring at Carlsbad.

TEMPERATURE, 167° FAH.

In each 16 fluid ounces there are contained, besides a little dissolved carbonic acid:

Sulphate of soda	19·860 grs.
Carbonate of soda	9·690 ,,
Chloride of sodium	7·970 ,,
Carbonate of lime	2·370 ,,
,, of magnesia	1·360 ,,
,, of strontia	0·007 ,,
,, of iron	0·020 ,,
,, of manganese	0·006 ,,
Phosphate of lime	0·001 ,,
,, of alumina	0·002 ,,
Fluoride of calcium	0·024 ,,
Silex	0·570 ,,
	41·880

Analysis of the Water of the Hauptquelle, the most saline of the Teplitz Springs.

In one litre is contained :

Carbonate of soda	0·384 grs.
,, of lime	0·042 ,,
Chloride of sodium	0·056 ,,

with traces of iron, manganese, magnesia, and silica.

Analysis of the Mineral Water of the chief Spring at Wildbad, Würtemberg.

Temperature, 98° Fah.

In each 16 fluid ounces there are contained, together with small amounts of carbonic acid, nitrogen, and oxygen :

Chloride of sodium	1·32 grs.
Carbonate of soda	0·53 ,,
,, of lime	0.24 ,,
,, of magnesia	0·07 ,,
,, of iron	0·02 ,,
,, manganese	0·02 ,,
Sulphate, of soda	0·40 ,,
,, of potash	0·02 ,,
Silex	0·39 ,,
	3·61

Analysis of the Buxton Waters (Playfair).

An imperial gallon at 60° Fah. contains :

Silica	0·666 grs.
Oxide of iron and alumina	0·240 ,,
Carbonate of lime	7·773 ,,
Sulphate of lime	2·323 ,,
Carbonate of magnesia	4·543 ,,
Chloride of magnesium	0·114 ,,
,, of sodium	2·420 ,,
,, of potassium	2·500 ,,
Fluorine (as fluoride of calcium)	trace
Phosphoric acid (as phosphate of lime)	trace
	20·579
Carbonic acid	15·66 cub. in.
Nitrogen	206·00 ,, ,,

Analyses exhibiting the Influence of the Wiesbaden Water upon the Urinary Secretion (Braun).

A man about thirty years old and in good health, was put upon a regulated and meagre diet, taking equal and moderate exercise. On the fourth day the urine was collected and examined :—

The quantity in the 24 hours was 45 ozs. (by weight).	
Urea	112·19 grs.
Uric acid	13·15 ,,
Chloride of sodium (common salt)	171·69 ,,

When an additional half pound of ordinary water was next day added to his diet, the results were :—

Quantity of urine in the 24 hours . .	51 ozs. (by weight).
Urea	119·42 grs.
Uric acid	13·61 ,,
Chloride of sodium . . .	173·51 ,,

Next day half a pound of Wiesbaden water was substituted for the ordinary water, and the following results :—

Quantity of urine in the 24 hours . .	66 ozs. (by weight).
Urea	221·73 grs.
Uric acid	20·74 ,,
Chloride of sodium . . .	204·12 ,,

A second trial of the same experiment gave

Quantity of urine in the 24 hours . .	63 ozs. (by weight).
Urea	186·91 grs.
Uric acid	16·14 ,,
Chloride of sodium . . .	221·31 ,,

It is stated that in other trials the augmentation of the urine varied from twelve to twenty ounces, and that the urea, uric acid, and common salt were also increased in the same proportion.

Effects of the mineral waters when taken in larger but

moderate doses.—The subject of the above experiment was again selected, and the same diet persevered with; a pound of common water was added to his diet on the fourth day, and the quantity and composition of the urine was as follows :—

Quantity of urine in the 24 hours . .	61 ozs. (by weight).
Urea	166·91 grs.
Uric acid.	14·04 ,,
Chloride of sodium . . .	201·71 ,,

The next day, a pound of the mineral water was taken in the course of from half to three-quarters of an hour, and the

Quantity of urine in the 24 hours . .	76 ozs. (by weight).
Urea.	246·354 grs.
Uric acid	23·712 ,,
Chloride of sodium . . .	249·31 ,,

In three other trials, the urine varied in quantity from seventy to eighty-five ounces, the urea from 247 to 265 grains, the uric acid from nineteen to twenty-eight grains, and the chloride of sodium from 263 to 320 grains. Only one experiment is given by Dr. Braun of the effect on the urine produced by the waters, when taken in very large doses; when

Quantity of urine in the 24 hours . .	48 ozs. (by weight).
Urea	114·12 grs.
Uric acid.	12·91 ,,
Chloride of sodium . . .	226·11 ,,

In another observation the quantities only of the urine were determined, and found to be fifty-three and fifty-one ounces respectively.

The physiological effects produced by the use of these waters, in the form of either the tepid or warm bath, appear to be the same as those induced by a mixture of com-

mon and sea water, and I believe that no real difference could be distinguished between the effect of one and the other.

Effects of tepid baths on the urine.—Dr. Braun has also given in his work the effect of these baths on the urine, choosing for the observations a man, previously prepared by a regulated diet, and moderate exercise. On the three days of this diet, the examination of the urine gave the following results :—

Quantity of urine passed in the 24 hours	48 to 54 ozs. (by weight).
Urea	110 to 138 grs.
Uric acid	11 to 13 ,,
Chloride of sodium	160 to 176 ,,

The next day, when taking a bath of ordinary water of half an hour's duration, at the temperature of about 90° Fah., the numbers were,—

Quantity of urine in the 24 hours	39 ozs. (by weight).
Urea	141·32 grs.
Uric acid	14·81 ,,
Chloride of sodium	174·11 ,,

On the following day, a bath of the mineral water was taken at about the same temperature and of the same duration, and the effects of the urine are seen to be,—

Quantity of urine in the 24 hours	56 ozs. (by weight).
Urea	181·90 grs.
Uric acid	13·01 ,,
Chloride of sodium	169·44 ,,

Repetitions of the experiment gave,—

Quantity of urine in the 24 hours	58 ozs. (by weight).
Urea	121·31 grs.
Uric acid	16·02 ,,
Chloride of sodium	234·12 ,,

When the experiments were multiplied, somewhat variable results were obtained, but there was always produced by the

use of the mineral an augmentation of the quantity of urine to the extent of some ounces, and at the same time a notable difference in the amount of the chloride of sodium.

Effects of hot baths on the urine.—When the temperature of the bath was increased to 97° Fah., the results became modified, and were as follows :—

A subject placed in circumstances similar to those above indicated, passed during three days from forty-two to forty-five ounces of urine. On the fourth day took a bath of ordinary water at the temperature of 97° Fah. ; much perspiration took place during and after the bath, and the urinary secretion was—

Quantity in the 24 hours . . .	39·5 ozs. (by weight).
Urea	167·11 grs.
Uric acid	16·35 ,,
Chloride of sodium . . .	191·34 ,,

The same regimen being continued, on the sixth day a bath of mineral water at the temperature of 97° Fah. was taken, which produced much perspiration.

Urine in the 24 hours	37 ozs. (by weight).
Urea	263·79 grs.
Uric acid	11·41 ,,
Chloride of sodium . . .	201·01 ,,

Further experiments exhibited a diminution of from four to ten ounces in the quantity of urine when a mineral hot bath was used, and from one to five ounces after the use of the ordinary hot bath.

From experiments made on the perspiration of patients submitted to the thermal treatment at Wiesbaden, it would appear that neither the internal nor external use of the waters have any effect in increasing the amount of common salt contained in the perspiration, and therefore this principle does not appear to be eliminated by the skin.

*Analyses exhibiting the Influence of Wiesbaden Waters upon the Urinary Secretion (Neubauer).**

The results of Neubauer, refered to at page 476, differing completely from those given above, will be seen in the following Table, in which the amounts of uric acid contained in the 24 hours' urine are indicated.

	Minimum.	Medium.	Maximum.
First Individual.			
α Living as usual (5 days).	0·31 grs.	4·32 grs.	9·41 grs.
β Taking a bath of warm water each day for half an hour, at 82° Fah. (5 days)	5·56 ,,	6·79 ,,	8·18 ,,
γ Bath as before, in addition to which about 17 or 18 fl. ozs. of Wiesbaden water (Kockbrunnen)(7days)	2·01 ,,	4·17 ,,	7·72 ,,
Second Individual.			
1. Living as usual (8 days)	5·09 ,,	7·56 ,,	10·34 ,,
2. Living as β, first individual (5 days). . .	7·10 ,,	9·26 ,,	12·50 ,,
3. Living as γ, first individual (8 days). . .	4·68 ,,	7·87 ,,	10·34 ,,

* Extracted from Thudicum's Work on Urine.

Cases of Acute Rheumatism, in which an Examination of Presence of

MALES.

Name.	Age.	Occupation.	Habits of life.	Hereditary predisposition.	General state of health.	No. of attacks.
G. J.	30	Cabman.	Regular.	None to rheumatism or gout.	Good till he had rheumatism	Third attack. First about eight years since.
J. J.	31	Linen-draper's-man.	Regular.	—	Pretty good.	Second attack. First three years before.
W. K.	20	Carpenter.	Regular. Temperate.	None to gout or rheumatism.	Good.	First attack.
T. W.	33	Tailor.	Usually not intemperate. Lives well.	Mother subject to rheumatism; sisters and brothers not affected.	Good.	First attack.
H. W.	28	Costermonger.	Not given.	None stated.	Good.	First attack.
J. S.	57	Carpenter.	Lives well; not intemperate; drinks beer, & a little gin.	Grandfather on father's side affected with rheumatism.	Good.	First attack
J. G.	26	Labourer, lately a potman in a public-house	Not stated.	None to gout or rheumatism.	Not good for the last few years; scrofulous knee, &c.	First attack.
J. A.	34	Cabman.	Not stated.	Not stated.	Good till he had rheumatism	Second attack. First attack eight years since; many joints affected.

the Blood was performed for the purpose of ascertaining the Uric Acid.

MALES.

Cause of.	Symptoms during attack.	State of blood.
Cold.	Commenced in knees, afterwards shoulder, elbow. Skin perspires freely. Pulse 72. Tongue white, furred; thirst moderate; no appetite. Slight pericarditis; old heart affection.	Clot firm, slightly buffed; serum alkaline; sp. gr. 1027·04 at 60° F. No trace of uric acid.
None assigned.	Commenced in feet, then in knees, wrists, and ankles. Pulse 112, full, hard. Tongue furred; no appetite; thirst. No cardiac affection.	Clot firm; a little cupped; serum alkaline; sp. gr. 1026·8 at 69° F. No trace of uric acid.
None, except some draught.	Commenced in knees; then wrists, ankles, and feet. Pulse 84, hard. Tongue furred; skin hot. No cardiac affection.	Clot normal; serum alkaline; sp. gr. 1028·0 at 63° F. No uric acid.
—	Commenced in right shoulder, then left; afterwards right knee. Joints not very acutely affected. Pulse 88, hard. Tongue not furred; appetite moderate. No heart affection.	Clot buffed; not cupped; serum alkaline; sp. gr. 1028·4 at 55° F. No uric acid.
Cold.	Commenced in hip, then left ankle, knees; afterwards wrists and hands. Pulse 96, hard. Tongue furred; thirst; no appetite. No pitting on pressure. Free perspiration. No heart affection.	Clot firm; serum alkaline; sp. gr. 1028·8 at 48° F. No uric acid.
Cold.	Commenced in left knee and thigh, then right foot and instep; afterwards right elbow. Pitting on outer side of foot. Tongue furred. Pulse 78. No heart affection.	Clot normal; serum alkaline; sp. gr. 1029·2 at 51° F. No uric acid. *Blister fluid.* No uric acid.
—	Commenced in right thigh, then knee, back, shoulders, left elbow, wrist, and hand. No pitting of dorsum of hand. Pulse 108, rather hard. Tongue furred; perspiration; thirst. No heart affection.	Clot slightly buffed and cupped; serum alkaline; sp. gr. 1030·4 at 47° F. No uric acid. Second: Clot very slight buffed; serum alkaline; sp. gr. 1030·4 at 42° F. No uric acid.
—	Commenced in right hand, then feet, knees, shoulders, and hips, and ankles, and left hand; also fingers. Pulse 108, hard. Tongue furred; thirst; no appetite. No cardiac affection.	Clot little buffed; firm; serum alkaline; sp. gr. 1028·0 at 52° F. No trace of uric acid.

Name.	Age.	Occupation.	Habits of life.	Hereditary predisposition.	General state of health.	No. of attacks.
C. G.	30	Carpenter.	Regular.	None to gout or rheumatism.	Good.	First attack.
				FEMALES.		
H. M.	27	Servant.	Regular.	Father had rheumatism (not acute).	About a year since had slight hemiplegia, and six years ago paralysis of right side of face.	First attack.
A. M.	32	Dressmaker.	Regular.	None to gout or rheumatism.	Pretty good until lately.	Second attack. First attack commenced about four months ago. Second attack had been neglected for many weeks.
E. A.	40	Married.	Regular.	None to rheumatism or gout.	Good.	Second attack. First attack 14 years since, all joints affected.
R. K.	21	Servant.	Regular.	Not stated.	Good.	Second attack. First attack nine years since.
S. S.	17	Servant.	Regular.	None to gout or rheumatism.	Good.	First attack.
S. S.	26	Married.	Regular.	Mother slightly rheumatic; one brother has had 3 attacks of rheumatism.	Good until lately.	First attack.

Cause of.	Symptoms during attack.	State of blood.
—	Commenced in different joints of lower, then upper extremities; both wrists much swollen. No heart affection. Pulse 100, hard. Tongue furred; perspires much; thirst.	Clot buffed, cupped; serum alkaline; sp. gr. 1028·0 at 72° F. No trace of uric acid.
	FEMALES.	
Cold.	Commenced with tonsillitis; after some days right foot and ankles, then knees, then wrists and shoulders. Slight pericarditis. No pitting on pressure. Pulse 120. Tongue furred; thirst; no appetite: perspires freely.	Clot firm, slightly buffed; much cupped; serum alkaline; sp. gr. 1026·7 at 63° F. No trace of uric acid.
Cold.	First: commenced about four months since, as an attack of acute rheumatism, with nearly all joints affected, and some heart affection. (Not in hospital.) Second: all joints affected as before; after eight weeks came into hospital, with swelling of wrists and dorsum of hands, and some small joints of fingers, knees tender, and left elbow, shoulder somewhat painful. Pulse 84; not very febrile.	Clot not buffed or cupped; serum alkaline; sp. gr. 1030·0 at 60° F. No trace of uric acid. *Serum of blister* clear, pale yellow; sp. gr. 1026·0 at 60° F. No uric acid.
Cold—wet.	Commenced in shoulders, then ankles; afterwards elbows, wrists, knees. No heart affection. Pulse 105, hard. Tongue furred.	Blood serum by thread experiment. No trace of uric acid.
Not given.	Commenced in left foot and ankle, then right hand, wrist, and fingers; afterwards knees. Pulse 100, hard. Tongue furred; perspiration; thirst. No marked heart affection.	Clot firm, slightly buffed, and cupped; serum alkaline; sp. gr. 1028·8 at 60° F. No uric acid.
Cold.	Commenced in knees, then almost all joints of body; left wrist, right knee and ankle especially so. Pulse 130, hard. Tongue furred; much perspiration. Endocarditis; pericarditis.	Clot buffed, slightly cupped; serum alkaline, sp. gr. 1024·08 at 40° F. No uric acid.
Not known; perhaps cold from washing.	Commenced in knees, then ankles and feet; afterwards hands, elbows, and shoulders. No heart affection. Pitting on pressure of dorsum of hand. Pulse 108, hard. Tongue furred; moderate perspiration; thirst, &c.	Clot firm, slightly cupped and buffed; serum alkaline; sp. gr. 1027·6 at 48° F. No trace of uric acid.

Name.	Age.	Occupation.	Habits of life.	Hereditary predisposition.	General state of health.	No. of attacks.
C. L.	25	Married; a laundress.	Regular.	None to gout or rheumatism.	Not very good.	First attack.
M. A. P.	25	Laundress.	Regular.	None to rheumatism or gout; or questionable to rheumatism from father.	Good.	First attack.
A. P.	54	Cook; widow.	Regular.	None to rheumatism or gout.	Good.	First attack. Perhaps one thirty years before, but doubtful. Said to arise from mercurial ointment on hands.
M. A. R.	17	Servant.	Regular.	None to rheumatism or gout.	Not very good. Weak and hysterical.	First attack.
A. C.	30	Servant.	Regular.	None to rheumatism or gout.	Good.	First attack.
L. E.	31	Married. Household work.	Regular.	To rheumatism on father and mother's side.	Pretty good. Subject at one time to fainting (hysteria ?)	Third attack.
E. S.	27	Married.	Regular.	To rheumatism from mother. Two sisters affected.	For last few years has been in a weak state of health.	First attack.

Cause of.	Symptoms during attack.	State of blood.
Cold and damp.	Commenced in ankles, hips, and knees, then in joints of upper extremities. No heart affection. Pulse 116, hard. Tongue furred; thirst; no appetite.	Clot firm, cupped, buffed; serum alkaline; sp. gr. 1031·6 at 69° F. No trace of uric acid.
Cold.	Commenced in shoulders, then loins, feet, and hips. Since admission, ankles, knees, elbows, wrists, acutely inflamed. Pulse, 130, not full. Pain increased at night; much acid perspiration; tongue furred; no appetite. Pericarditis with effusion.	Clot firm, buffed, rather cupped; serum alkaline; sp. gr. 1029·5 at 60° F. No trace of uric acid by thread experiment.
—	Commenced in hip, then in knees, left wrist, and dorsum of hand. Little perspiration. Pitting of hand and legs on pressure. Albuminuria when admitted. Peri- and endocarditis. Query if very recent.	Clot firm, buffed, rather cupped; serum alkaline; sp. gr. 1024·8 at 60° F. No trace of uric acid.
Cold.	Commenced in both ankles, then both knees, hips, shoulders, elbows, wrists, and hands. No pitting on pressure. Pulse, 120, hard. Tongue furred, white; much thirst; no appetite. Distinct endocarditis.	Clot firm, normal; serum alkaline; sp. gr. 1026·32 at 65° F. No trace of uric acid.
Cold in the feet.	Commenced in knees; heart early affected; then hips and shoulders. Tongue much furred; much thirst; no appetite. Pulse 110 when admitted. Aortic regurgitant murmur. Perspiration moderate. Endo- and peri-carditis very severe.	Clot firm, somewhat buffed; serum alkaline; sp. gr. 1026·65 at 60° F. No trace of uric acid.
None assigned.	Affection of knees, ankles, wrists, shoulders. Moderate perspiration. Pulse 96, moderately full. Tongue brown, furred; thirst; no appetite. Slight endocarditis.	Clot firm, slightly buffed and cupped; serum alkaline; sp. gr. 1028·5 at 60° F. No trace of uric acid.
Cold and damp.	Commenced in knee, then ankles, hips, shoulders, elbows, and dorsum of hands. No pitting. Pulse 105. Tongue furred; thirst; no appetite; perspiration moderate. No heart affection.	Clot firm, buffed, cupped; serum alkaline; sp. gr. 1025·0 at 60° F. No trace of uric acid.

Name.	Age.	Occupation.	Habits of life.	Hereditary predisposition.	General state of health.	No. of attacks.
E. W.	43	Married. Takes in washing.	Regular.	To rheumatism from father. One sister affected.	Good.	Second attack. First at sixteen years of age.
E. E.	43	Widow.	Regular.	To gout from father. Two brothers had gout, and one acute rheumatism.	Very weakly.	First attack.
E. F.	18	Lives at home.	Regular.	To rheumatism from mother.	Not strong.	Fifth attack. First at nine years of age.
J. S.	38	Married.	Not stated. Lives poorly, insufficient food.	No tendency to gout. Father has rheumatism.	Good.	First attack.
A. R.	25	Servant.	Regular.	None stated.	Good, except rheumatism.	Second attack. First attack nine years since; all joints affected.
E. W.	34	Married.	Regular.	Not stated.	Good until lately; since last confinement has felt very weak.	First attack.
M. A. S.	22	Servant.	Lived pretty well; worked hard in general.	None to gout or rheumatism.	Good.	First attack.
M. B.	16	Servant.	Regular.	None to gout or rheumatism.	Good.	First attack.

Cause of.	Symptoms during attack.	State of blood.
None assigned.	Commenced in feet, then knees, hips, one wrist, shoulder, muscles of one side of neck and head. Pulse 96, hard. Tongue white, furred. Pitting of wrist and hand on pressure. Endocarditis (slight), old probably.	Clot buffed, cupped; serum alkaline; sp. gr. 1029·0 at 50° F. No trace of uric acid.
None discoverable.	Commenced in left hip, then in ankle and knee; afterwards wrists and dorsum of hands. Pitting on pressure. Pulse 108, full and hard. Tongue furred; thirst; no appetite. No heart affection.	Clot firm, large, buffed, slightly cupped; serum alkaline; sp. gr. 1026·4 at 55° F. No trace of uric acid.
Cold.	Commenced in ankles, afterwards in knees, shoulders, elbows and wrists, and joints of hands. Pulse 135, hard. Tongue furred; perspiration moderate; skin hot. No heart affection.	Clot buffed, cupped; serum alkaline; sp. gr. 1028·0 at 63° F. No trace of uric acid.
Damp residence; insufficient clothing. Nursing child when admitted.	Commenced in palmar surface of limbs, great toe much affected; also dorsum of foot; then hip, right arm, wrist, hand, &c. No heart affection. Pulse 100, hard. Tongue furred; thirst.	Clot firm; serum alkaline; sp. gr. 1028·8 at 52° F. No trace of uric acid.
—	Commenced with erythema nodosum, then joint affection; both hands, elbows, knees, and feet. No heart affection. Pulse 108. Tongue furred; thirst, &c.	Clot slightly buffed; serum alkaline; sp. gr. 1030·8 at 57° F. No trace of uric acid.
Nursing at the time. No very evident exposure.	Commenced in joints of lower extremities; then shoulders, elbows, wrists. No cardiac affection. Pulse 92. Tongue furred; thirst.	Clot buffed, much cupped; serum alkaline; sp. gr. 1030·0 at 56° F. No uric acid.
None known.	Commenced in right wrist, then right shoulder. Slight endocarditis. Pulse 116; thirst; perspiration.	Clot buffed, contracted and cupped; serum alkaline; sp. gr. 1030·4 at 53° F. No uric acid.
Not known. Lived in London a month.	Commenced in left wrist, then right; then right foot. Pulse 112, rather hard. Tongue furred; no marked perspiration. Some pitting over dorsum of foot. No cardiac affection.	Clot buffed, moderately cupped; serum alkaline; sp. gr. 1028·4 at 68° F. No trace of uric acid.

Cases of which the Minute Details were less known.

Name.	Sex.	Account of patient.	State of blood.
N. N.	M.	Acute rheumatism, diagnosed by a physician.	Clot buffed; serum alkaline: sp. gr. 1030·0 at 56° F. Uric-acid thread experiment gave no trace of uric acid.
M. C.	M.	Patient suffering from sub-acute rheumatism. Commenced about a year and quarter since in wrist and ankle, then other joints. Great toe never affected. No gout in family.	*Blister serum* alkaline; sp. gr. 1024·0 at 66° F. No trace of uric acid by uric-acid thread experiment.
A. K.	M.	Acute rheumatism, diagnosed by a physician.	Clot firm, buffed, and somewhat cupped; serum alkaline; sp. gr. 1028·0 at 60° F. Uric-acid thread experiment gave no trace of uric acid.
A. B.	—	Patient with acute rheumatism and pericarditis.	*Blister fluid;* serum alkaline; sp. gr. 1026·64 at 60° F. No trace of uric acid by thread experiment.
G. C.	M.	Sub-acute rheumatism of several years' standing. Great toe never affected; weather and not diet produces exacerbations.	*Blister serum;* serum alkaline; sp. gr. 1023·9 at 60° F. No uric acid by uric-acid thread experiment.

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